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A model for nationwide patient tracking

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THESIS

A MODEL FOR NATIONWIDE PATIENT TRACKING

by

Nicole M. Quinn

September 2009

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13. ABSTRACT (maximum 200 words)

The events of Hurricane Katrina raised awareness of the need to track patients nationwide. As patients were transferred out of the region quickly, they often could not be located by family members or the evacuating facilities, which caused psychological and operational stress for all those involved. The literature shows that a nationwide patient tracking system does not exist today, and by putting patient tracking at the forefront of preparedness, challenges during response will be minimized.

The researcher used grounded theory to gather data through a series of interviews that explored what an ideal nationwide patient tracking system would look like, when information should be shared, what data is necessary to ensure a useful system, where data is available, and who will be given access to the data. The interviews resulted in the development of a national system composed of 17 localized modules. The individual modules need to be constructed and maintained by individual entities, such as public health, the military, law enforcement, and human services, while the effort itself requires a champion to organize the collaborative undertaking a role emergency management agencies can readily fill.

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A MODEL FOR NATIONWIDE PATIENT TRACKING

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I. INTRODUCTION

A. THE PROBLEM OF PATIENT TRACKING FOR HOMELAND SECURITY

The events of Hurricane Katrina raised awareness of the need to track patients nationwide. As patients were transferred out of the region quickly, they often could not be located by family members or the evacuating facilities. Reentry teams were deployed to states receiving patients to gather patient names and location. This lack of real-time information caused many problems.

Patient tracking is important for three reasons. First, evacuating facilities want to know where their patients were transferred. Second, the ability to track patients helps relieve the psychological stress to the family. Third, a properly implemented patient tracking system will help streamline emergency operations overall because it will designate roles and responsibilities, diverting work from one agency to another that is more capable of handling that role.

Patient tracking today is done in silos. Some entities use patient tracking daily; however, the information is only shared internally. Other agencies do not employ patient tracking at all. Overall, patient tracking needs to be redefined, so that agencies do not see it as a process that they alone own, but as a solution to a greater social problem.

> There is no literature that indicates that there is a model for what a nationwide patient tracking system should look like. Problems such as when to share information, what data is necessary, where is the data available, and who will access the data, all need to be answered in order to develop an ideal model of what a nationwide patient tracking system should look like. It is impossible for any one person to know the intricacies of each stakeholder involved. In order for a national patient tracking system to be viable, it is important that the system be meaningful to each stakeholder. It must serve the needs of each one while, at the same time, integrate into a national system. This thesis will attempt to provide such a model.

B. RESEARCH QUESTIONS

What does an ideal nationwide patient tracking system look like? When should information be shared? What data is necessary to ensure a useful system? Where is the data available? Who will be given access to the data?

C. LITERATURE REVIEW

There is little literature about national systems for patient tracking. The literature that does exist ranges from agency-specific patient tracking systems, such as emergency medical services (EMS), to attempts to develop a more robust nationwide patient tracking system that shares data between agencies.

1. Nationwide Patient Tracking Models

Regarding nationwide patient tracking models, the literature is mainly authored by state hospital associations and emergency management agencies in the form of websites, studies, and requests for proposals (RFP).[1] All of the efforts are post-9/11 and some are post-Hurricane Katrina. If an event is referenced as a catalyst for such a need, Hurricane Katrina or 9/11 is referenced.

The most notable piece of literature that discusses a nationwide model can be found on a website titled *Patient Tracking: A Resource Portal for Communities* authored by COMCARE Emergency Response Alliance. The website details a process led by the Virginia Hospital and Healthcare Association (VHHA) and COMCARE to develop a national framework to be used by other states to assist in the development of a national patient tracking system.

In a white paper published by COMCARE in 2006, the results of Phase I of the project are described in detail. Focus groups were hosted with subject matter experts consisting of patient care, emergency management, hospital planning, disaster services, and public health (COMCARE, 2006, p. 3). The goal was to define what a patient

[1] A request for proposal is an invitation for contractors to bid on specific projects requiring specific functionalities. The functionalities are often clearly outlined in the RFP.

tracking system should look like and the “must-have” and “nice-to-have” requirements of such a system (COMCARE, 2006, p. 3). The stakeholders needing access to a patient tracking system were also defined to include volunteers, telematics call centers, 911 dispatch, hospitals, search and rescue, EMS, transportation, emergency management, hazardous materials, public health, law enforcement, and fire fighters (COMCARE, 2006, p. 5). Some stakeholders stated that specific domains need to share information or that they had specific information to contribute to the system (COMCARE, 2006, p. 11). Following the focus groups, a summit meeting was held to examine and finalize the results (COMCARE, 2006, p. 3).

The results of Phase I defined a patient tracking system as “a means to improve emergency response and preparedness capabilities electronically by capturing and distributing patient information to various stakeholders, such as emergency managers and local hospitals, throughout the system of care from the emergency event” (COMCARE, 2006, p. 3). Two trends were highlighted. The first trend was the need to share information that involves 911, EMS, and hospitals (COMCARE, 2006, p. 3). The second was the need to share medical records acquired in routine medical care (COMCARE, 2006, p. 3).

The results of Phase I also detailed functional requirements of the patient tracking system. These requirements include a system that can be used every day and for multiple purposes, not just in or for emergencies (COMCARE, 2006, p. 3). The system must be easy to use and disparate systems must be coordinated for efficiency, allowing a number of organizations to both read and write to the system (COMCARE, 2006, p. 3–4). During emergencies, the main goal of the system would be to identify, triage, and track patients as they move through various care centers, whether healthcare or social services is administered, and for local systems to be accessible nationally, necessitating an interoperable system (COMCARE, 2006, p. 4). The method in which data is shared is diagramed in Figure 1. The system not only looks at patient data but also looks at resources (COMCARE, 2006, p. 12).

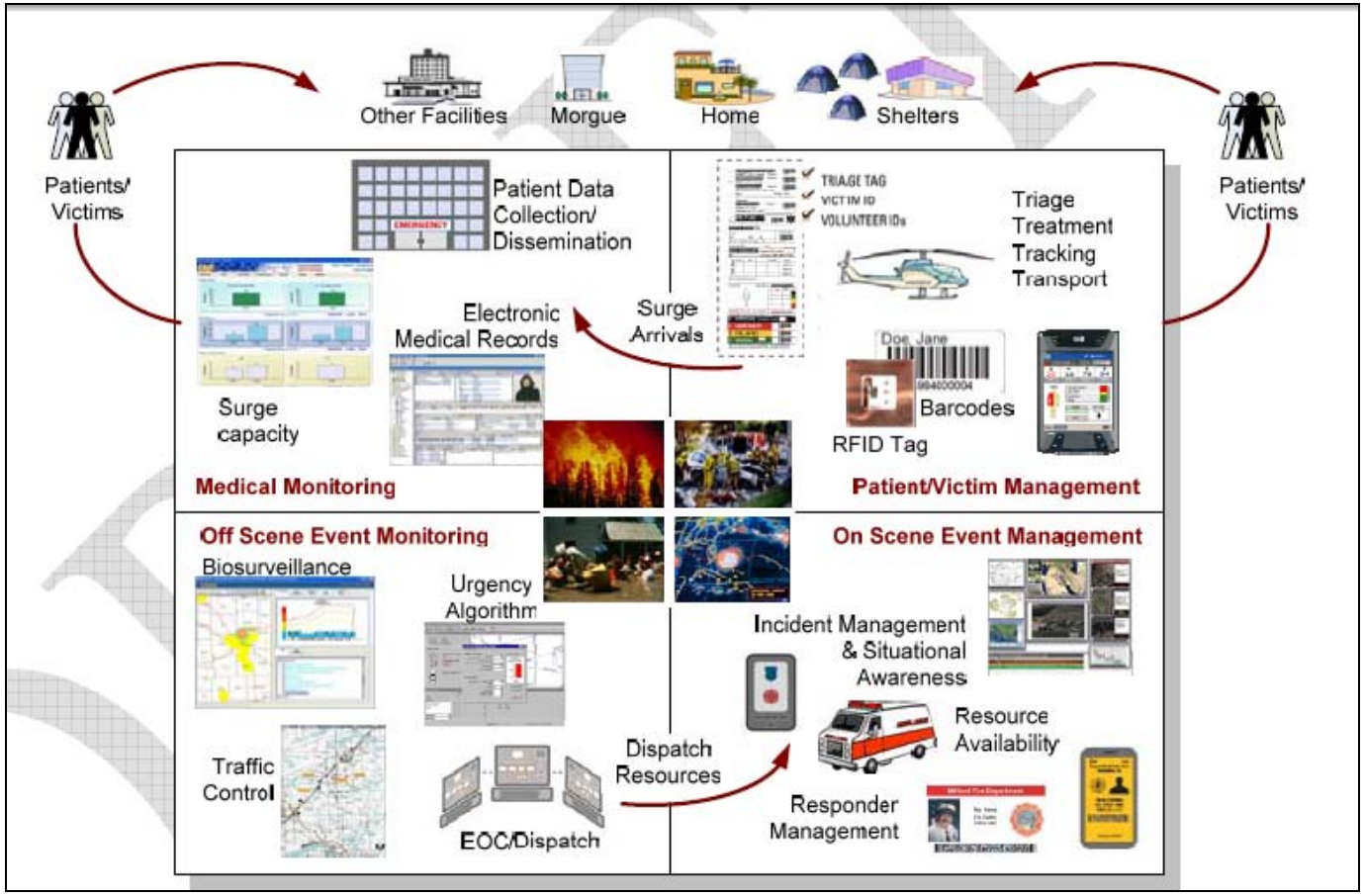

Figure 1. Patient Tracking Environment (From COMCARE, 2006, p. 6)

The website also outlines Phase II and Phase III of the project. Phase II is titled "Patient Tracking Toolkit." The goal of Phase II is to develop a toolkit for success that includes interoperability, a model RFP, policy and process guidance, and a deployment plan with lessons learned and best practices (COMCARE, *Phase II*, n.d.). To date, a toolkit is not displayed on the website. The final phase, or Phase III, will test and refine the framework it intends to create in Phase II (COMCARE, *Phase III*, n.d.). To date, no testing has been completed.

While the model noted above discusses a number of important requirements such as security, general data requirements, and baseline technical requirements, it does not provide specific guidance how to implement patient tracking into current processes in each domain in order to capture important information. What information do hospitals need to capture? Where can that information be captured in their current processes? It also does not explain, once the system is enhanced, the detailed requirements of information sharing. One the information is captured by one domain, what data elements need to be shared with other domains and how and why is that important? These are all important points to consider during the implementation process.

2. Partial Patient Tracking Systems

Other states and localities have attempted to implement or have implemented partial patient tracking systems. These efforts can be found in RFP literature; however, this literature merely details the system scope and requirements and does not discuss critical aspects of what the model should actually look like.

The St. Louis Area Regional Response System (STARRS) in May 2004 enhanced its patient tracking system through a request for proposal, which was granted to IBM and implemented in 2006. The goal was to develop a partial patient tracking system to be used every day that would identify, triage, and track patients moving from emergency medical service units on the scene to hospitals where they would be ultimately treated (East-West Gateway Council of Governments, 2004, p. 1). Patients would be assessed on the scene and issued a bar-coded patient identification bracelet encoded with their information (East-West Gateway Council of Governments, 2004, p. 1). A wireless

system would transfer the information to hospitals and emergency command staff. Both would monitor the situation, which would allow the emergency operations center (EOC) the ability to direct patients depending on hospital surge and allowing hospitals to prepare for an influx of patients with specific symptoms and needs (East-West Gateway Council of Governments, 2004, p. 1). While this system is an excellent example of a tracking system that could be used in a mass casualty event where a number of wounded victims are located in one area, it does not take into account the greater need for patient tracking.

The state of Delaware issued an RFP in 2007 to develop an Integrated Public Health Preparedness System. One aspect of this integrated system was to develop a partial patient tracking system that would eventually feed into a full-service emergency management system titled the Delaware Public Health Emergency Management System (DE-PHEMS) (Delaware Health and Social Services, 2007, p. 2). The DE-PHEMS was envisioned to serve the situational awareness needs of the Division of Public Health's (DPH) State Health Operations Center (SHOC), which is the public health EOC (Delaware Health and Social Services, 2007, p. 7). DE-PHEMS was not a goal of this RFP; however, it was asked that the products developed as a result of this RFP be compliant with the future goals of DE-PHEMS (Delaware Health and Social Services, 2007, p. 8).

One aspect of DE-PHEMS is the Delaware Patient Tracking System (DPTS). The main purpose of DPTS is described on page 11 as the need to "track information regarding individual patients and groups of individuals including the processes of identification, evaluation, treatment and movement through a SHOC event…used for planning bio-events such as Pandemic Influenza and Anthrax incident[s]" (Delaware Health and Social Services, 2007, p. 11). This indicates that the system will not be used in events that are not related to public health emergencies.

The functions of DPTS are also outlined in the RFP and include updating patient data to include disease and injuries; capture treatment provided and at what facility; identify victim, home address, medical history, and vaccinations; track quarantined and isolated individuals and close contacts; and track transportation used to transport patient

(Delaware Health and Social Services, 2007, p. 12). The system is also required to be real-time, provide unique patient identifiers, capture emergency scene information, and import home health data (Delaware Health and Social Services, 2007, p. 12).

The RFP diagrams how various systems will interact to capture both healthcare and social service data for a full-service patient tracking system. Sites providing healthcare and social services mentioned (Delaware Health and Social Services, 2007, p. 107) are Delaware Neighborhood Emergency Help Center (clinics providing prophylaxis or treatment during a biological event), Delaware Family Assistance Centers, Federal Emergency Management Agency (FEMA) Centers, American Red Cross Centers, Emergency Medical Services Data Information Network (EDIN), and walk-ins in Emergency Clinics (see Figure 2). However, it is not clear how Delaware would be able to gain access to FEMA or American Red Cross systems to feed into its system, and there seems to be an assumption that most medical records are currently electronic; they are not.

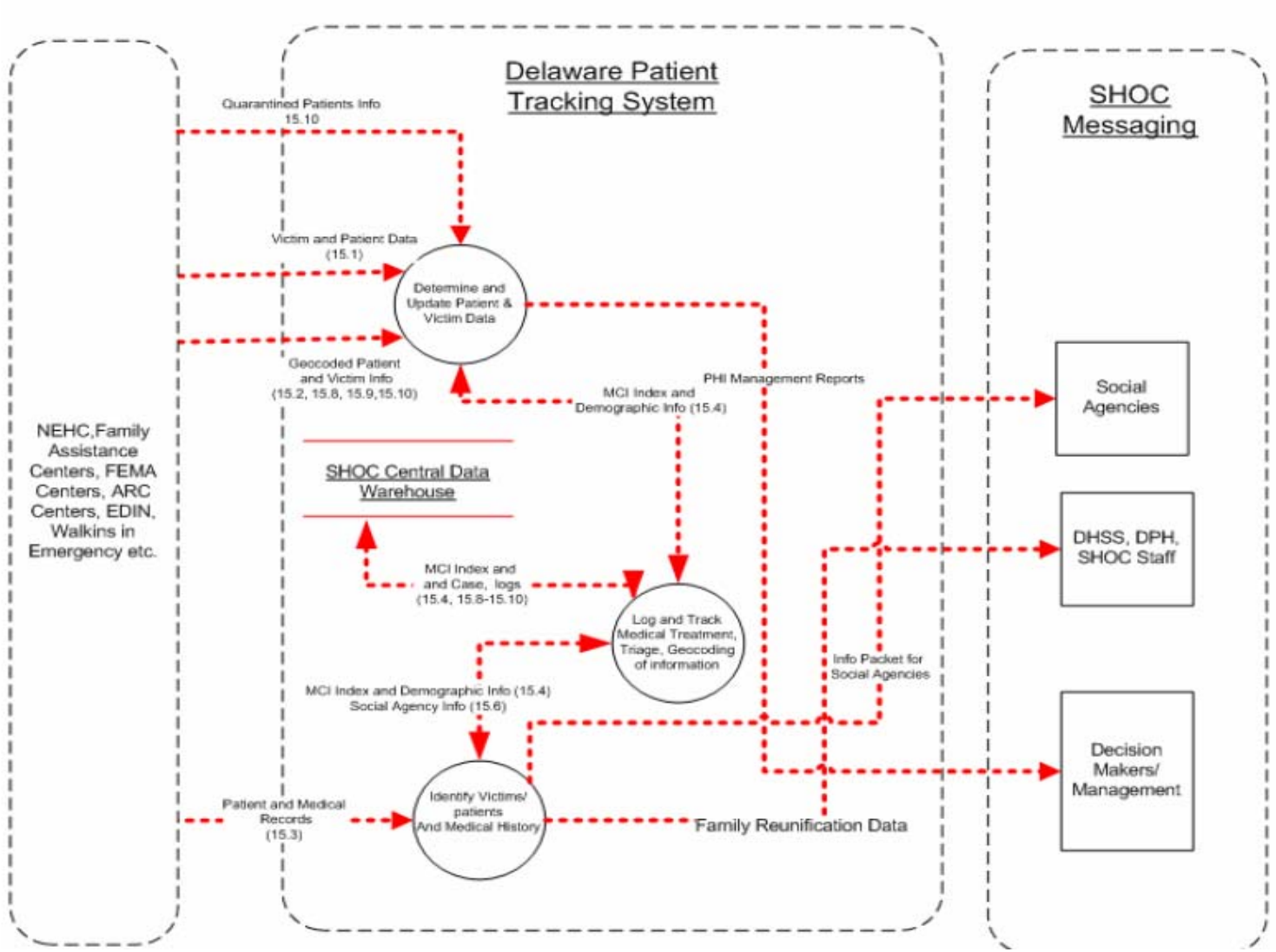

Figure 2. Delaware Patient Tracking System (Future) (From Delaware Health and Social Services, 2007, p.107)

The RFP mentions (Delaware Health and Social Services, 2007, p. 12–15) other systems that the Delaware DPH owns that house patient data. It asks that the new Integrated Public Health Preparedness System not only interface with these systems but enter historical data from existing systems to the new system (Delaware Health and Social Services, 2007, p. 12). This implies that the new system will be a data warehouse, needing huge amounts of space at a great cost. It also provides a summary description of each of the DPH systems and along with data flow diagrams for each, showing what databases link. For example, the Delaware Electronic Reporting and Surveillance System (DERSS) data flow diagram (Delaware Health and Social Services, 2007, p. 93) shows that DPTS data records, which indicate a reportable disease, will feed into the DERSS System, an epidemiological system that tracks disease trends. The EDIN data flow diagram (Delaware Health and Social Services, 2007, p. 95) shows DPTS data going to the EDIN System as well as EDIN data going into DPTS. However, it is unclear as to how this data will be used. Will it provide patient-specific information and be accessible to healthcare workers in the field, or will it just provide access to summary data for those in command and control roles?

While there seems to be a series of models within the Delaware system that are innovative and forward thinking, the problems with the model, again, lie in implementation. There is not enough information provided in this model to instruct a nation how to implement nationwide patient tracking.

This thesis will attempt to answer the question of what patient tracking is by looking at process to achieve nationwide patient tracking. It will go deeper and wider than the projects noted above. It will expand from one entity to multiple entities; it will define interoperability, patient data, and stakeholders. It is the hopes of the researcher that the model derived in this thesis will provide a clear picture of nationwide patient tracking system means to the individual stakeholders involved, and how they can contribute to the project.

D. RESEARCH SIGNIFICANCE

The consumers of this research are those entities responsible for Emergency Support Function (ESF) 8, the Public Health and Medical Group; ESF 13, Public Safety and Security; ESF 5, Emergency Management; and, ESF 6, Mass Care, Emergency Assistance, Housing, and Human Services. According to the *National Response Framework*, ESF-8 is responsible for patient tracking during emergency events; however, other agencies must play a vital role in order to ensure the project's success.

II. METHODOLOGY

A. GROUNDED THEORY

This thesis will develop a nationwide patient tracking model through the use of grounded theory. Grounded theory is a research process that provides the researcher a logical framework in which to gather data and develop a theory from that data (Glaser & Strauss, 1980, p. 1). Since substantive theoretical models for nationwide patient tracking do not currently exist, as determined by the literature review, grounded theory will allow the researcher to develop a detailed ideal model (Strauss, 1998, p. 12). The methodology will allow interview participants to inject subjectivity based on first-hand experience into the theory building process. It becomes the responsibility of the researcher to analyze the raw data and develop emergent themes that will help to build the theory.

One of the many benefits of grounded theory is that the end product will generally be understood by practioners rather than only by social scientists (Glaser & Strauss, 1980, p. 3). Having practioners establish the theory through the data collection process helps to guarantee this benefit. Another benefit to using grounded theory is that the end theory cannot be refuted because it was based on data and not assumptions (Glaser & Strauss, 1980, p. 4). Certainly, there can be failures in research, such as failures associated with researcher bias and subjectively; however, if the researcher abandons these tendencies and focuses objectively on the project, future researchers will have a difficult time refuting the theory derived from the data.

B. RESEARCH DESIGN

The researcher first examined literature on nationwide patient tracking models that currently exist. Based on the lack of literature found on detailed nationwide patient tracking, the researcher then entered the study with an understanding that a nationwide patient tracking system may need to be a system of systems, meaning that existing individual organizational systems would need to merge in a way that nationwide tracking could be achieved. In addition, the literature showed that patient tracking may not be

limited to organizations focused solely on health issues. The researcher believed that either patient tracking was already conducted by each stakeholder independently or that each stakeholder had an independent need to track patients. As a result, a number of stakeholders were theoretically sampled and interviewed for their perspectives on patient tracking. The researcher believed that by first looking at the individual stakeholders and processes, a greater model or a nationwide model could be achieved.

The researcher chose to include subject matter experts from the fields of public health, EMS, healthcare, social services, military, and emergency management in the interview process. Not all of the interview candidates were predetermined. Some emerged as individual interviews were conducted. Expertise within each field ranged. In the field of public health, expertise included clinical service providers, laboratory technicians, public health planners, and casualty care and transport providers. In the field of EMS, expertise included advanced and basic life support technicians and field commanders. In the field of healthcare, expertise included hospital emergency planners and emergency department physicians. In the fields of social services and emergency management, shelter planners, and missing person's planners, respectively, were utilized. In the military field, the focus was on casualty care and transport. Technology experts were also employed to validate some of the technology ideas designed to gather and share information presented by subject matter experts.

The primary method of data collection used was semi-structured, qualitative interviews conducted face-to-face or over the phone. Approval for the interviews was granted by the Naval Post Graduate School's Institutional Review Board. An invitation to interview was sent to each candidate with a brief description of the project. Interview questions were not provided prior to the interview. Each interview was recorded and later transcribed.

Qualitative data was the primary data type collected during the interviews. Early interview participants were asked to explore two primary categories of patient tracking. The first was to discuss current methods of patient tracking used within the interviewees' agencies and organizations. The second was to discuss an ideal patient tracking system. The researcher asked the following question of interview candidates.

- Have you ever had to track patients?
    - If yes, could you describe the event? If the interview participant did not include the following in the story, the following questions were asked.
        - What patient information did you share?
        - How was the information obtained?
        - With whom did you share it?
        - How was it shared?
    - Did you feel the experience was a success?
    - Do you think it could be improved upon? If yes, how?
- Do you feel a patient tracking system would be useful during emergencies? Explain in detail your vision.
    - If yes:
        - What patient information do you think it should contain?
        - How and when should it be collected?
        - Who should store it and make it available?
        - Who should have access to the data?
        - Under what circumstances should it be made available or shared?

When interview participants introduced new or emerging concepts, later interview candidates were asked about the concepts that emerged to determine if other stakeholders felt those concepts were valuable and for the researcher to gain a clearer understanding of the concept itself. This procedure helped to enhance validity. Once it became clear that theoretical saturation was achieved, that is, similar properties were continuing to emerge, the interviews ceased. A total of 16 interviews were conducted.

Once the data were transcribed, a coding process was used to draw conclusions. First, the data was examined to determine the stakeholders involved. The stakeholders

were then associated with the appropriate Emergency Support Function as identified in the *National Response Framework*. Next, the data were separated by current processes and ideal processes for patient tracking. Although the interview questions were designed to discuss these two concepts separately, the interview candidates jumped between the two concepts frequently and, at times, discussed more than one area of expertise.

The data were then coded to identify emergent themes in both current and ideal patient tracking processes. These themes led to a detailed current process flow for each stakeholder. Using the themes, the researcher then analyzed how the current process should change to meet the needs of an ideal patient tracking system. This resulted in the ideal patient tracking model process flow. The ideal model process flow was then examined to develop technology modules that could achieve nationwide patient tracking. The relationships between these technology modules along with the role of each actor are shown in two final process models.

C. RESEARCHER AS RESEARCH INSTRUMENT

There are challenges to using the researcher as a research instrument as noted by Piantanida and Garmin (1999) in the article "The Concept of 'Researcher as Research Instrument' within the Hitherlands of Research" (2009). The researcher's limited worldview may have impacted the data ultimately collected because the researcher chose interview candidates based on individual experience rather than using an objective methodology. The researcher could have chosen to perform a stakeholder analysis to determine interview candidates. John M. Bryson (2004) introduces a number of stakeholder analyses in his book, *Strategic Planning for Public and Nonprofit Organizations*. An appropriate tool that could have been utilized is the Power versus Interest Grid. If the researcher had analyzed the power and the interest of various stakeholders, those found with both high power and high interest could have been interviewed. This could have eased the process of implementation, as the high power, high interest stakeholders would have already bought into the model itself. In addition, if the researcher had employed this process, it may have resulted in more, less, or simply different subject-matter experts. Nonetheless, a stakeholder analysis was not performed

due to time constraints. Determining levels of power and levels of interest of the various stakeholders could be perceived as a thesis within itself.

In addition, using the researcher as a research instrument could affect the outcomes of the data collected in the interviews. It is possible that the researcher may have directed the conversation towards concepts that seemed more feasible or more interesting to the researcher. Although the researcher attempted to remain objective, it is uncertain whether total objectivity in data collection and analysis was achieved.

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III. ANALYSIS

To develop a nationwide patient tracking system, data were gathered through 16 qualitative interviews with subject matter experts from the field of public health, EMS, healthcare, social services, military, and emergency management. Overall, three levels of analysis were performed in order to achieve a nationwide patient tracking model.

Level One—Identifying Stakeholders—examined data to determine the stakeholders involved. The stakeholders were then associated with the appropriate Emergency Support Function as identified in the *National Response Framework*.

Level Two—Identifying Emerging Themes in Local Patient Tracking—first separated the data by current processes and ideal processes for patient tracking. The data was then coded to identify emergent themes in both current and ideal patient tracking processes. These themes led to a detailed current process flow for each stakeholder. Using the themes that emerged when analyzing data on ideal patient tracking models, the researcher then analyzed how the current process should be changed to meet the needs of an ideal patient tracking system; this resulted in the ideal patient tracking model process flow.

Level Three—Examining Themes in Individual Ideal Patient Tracking Models—examined the ideal model process flow to develop technology modules that could achieve nationwide patient tracking. The relationships between these technology modules along with the role of each actor were also detailed.

A. LEVEL ONE ANALYSIS—IDENTIFYING STAKEHOLDERS

The first level of analysis included an examination of all interviews conducted to determine what data pertained to which stakeholders. The interview data were examined to identify the following stakeholders:

- Public health
- EMS

- Hospitals
- Law enforcement
- Emergency management
- Human services

These stakeholders were then associated with the appropriate Emergency Support Functions (ESF) as defined in the U.S. Department of Homeland Security's (2008) *National Response Framework* (NRF). This framework defines the roles and responsibilities of the various disciplines as they relate to emergency preparedness and response. By organizing information by ESFs, further clarification of roles and responsibilities for patient tracking can be achieved. Patient tracking is only vaguely addressed in the NRF under ESF 8: Public Health and Medical Services (Department of Homeland Security, *Emergency Support Function #8*, 2008, p. 5).

- ESF 8: Public Health and Medical Services
  - Public health
  - EMS
  - Hospitals
- ESF-13: Public Safety and Security
  - Law enforcement
- ESF-6: Mass Care, Emergency Assistance, Housing, and Human Services
  - Human services
- ESF-5: Emergency Management
  - Emergency management

B. LEVEL TWO ANALYSIS—IDENTIFYING EMERGING THEMES IN LOCAL PATIENT TRACKING

Once the stakeholders were appropriately gleaned from the interviews and organized in a manner that would help to clarify roles and responsibilities, the researcher focused on emerging themes in the data describing current patient tracking systems and ideal patient tracking systems for each stakeholder. The following emerged and are defined below.

- *Definition of Patient Tracking:* Detailed explanations of patient tracking.
- *Actors:* People, entities, or systems that are used to achieve patient tracking (e.g., nurses, law enforcement, or dispatch).
- *Information Exchange Method:* The process used to share information between actors (i.e., electronic, verbal, or written).
- *Data:* The type of information collected by actors (e.g., name, address, or medical history).
- *Timing:* When information sharing should occur (i.e., during catastrophic emergencies only or during normal operations).
- *Ownership:* Which actor, if any, should take ownership of a nationwide patient tracking system?
- *Identification:* This explores methods in which to identify individuals in the field so that any updates to their "file" will be sure to go into the appropriate file.
- *Strengths and Weaknesses:* This explores lessons learned when operating current patient tracking systems (e.g., technological challenges or training).

In order to examine this analytical process, data gathered on EMS will be detailed below. The reader can assume the same process was used to analyze data from the other stakeholders.

1. Current Patient Tracking Process for Emergency Medical Services

The current process flow is important and must be examined because it is a detailed description of how the field of EMS operates. It is important that when constructing an ideal model that these processes are not disrupted too much. Patient tracking is meant to enhance the current operational process, not degrade it.

Five interview participants provided detailed information relating to the current patient tracking process in EMS. To start, EMS felt as if the ***definition of patient tracking*** was taking a patient from the scene to the hospital. One participant stated: "Ideally, it would be best to identify each individual at the scene and give them a number and be able forward track and backtrack." The national standard is being able to track

patients through the "continuum of care that starts with dispatch when a call comes into 911. You want to have an electronic record of that that patient once they enter the system." Patient tracking also includes sharing information. Another participant said: "EMS shares information with hospitals but in a major incident, they need to share information with family members."

The interview participants, in totality, stated that seven ***actors*** participate in EMS and all are important to either gathering patient information or sharing patient information. The seven actors include the patient or member of the public, 911 dispatch, EMS, hospitals, public health, EMS authority, and the emergency management agency. The patient interacts with 911 dispatch; 911 dispatch interacts with an emergency medical service technician or a field commander, who then, in turn, interacts with the patient on the scene and the hospitals receiving the patients. The on-scene commander interacts with the EMS authority who then shares information with the governor, the legislature, and other incident-specific organizations. One interview participant clearly showed the relationship between EMS and hospitals when he said that the EMS portion of the incident command system usually does patient tracking at the scene and then relays that information to the hospital over the radio.

The ***information exchange method*** was also extracted from the interviews. Information was exchanged using verbal, electronic, and written methods. It is certainly normal for a potential patient to call 911 dispatch and provide their complaint through verbal means. Or, EMS technicians will call hospital physicians over the radio to receive patient care orders if the patient cannot be stabilized. One interview participant described a mass casualty event that uses triage tags with handwritten patient details for tracking and places patient names on a board in order to prioritize each patient for transport to the hospital. The tags are later collected after the patient is transported to the hospital and given to the on-scene commander so that there is knowledge of where the patient was taken. The information on the board is erased and the information on the tag is the documentation. The on-scene commander verbally provides the number of patients to the hospital. In the end, all of the patient care information is placed in a patient care

reporting system that can be shared electronically with some stakeholders. However, "triage tags are only broken out for major incidents and people are not use to using them."

The types of ***data*** collected or generated throughout the EMS process are name, age, signs and symptoms, case number, medical care provided, response to care provided, location of the EMS vehicle, where the patient was taken, and total number of casualties. The 911 dispatch assigns a case number to the event. One participant pointed out: "If there are a lot of patients, the issuing of the unique patient identifier may happen on the scene once they know who is there. The incident number needs to carry through the entire system." The system should also be flexible enough to "add a patient identifier if the patient skips EMS." Sometimes people leave the scene and "they go directly to the hospital or they come back to the scene." All of this data is collected at different parts of the process and is shared with different actors. Ultimately, a complete account of the patient is documented in a detailed patient care report.

Timing also emerged as a theme. Some stated that the current patient tracking process is not used all of the time. Current processes require that patient tracking be "turned-on" during mass casualty events. In addition, while some real-time information sharing is done during the event (mostly verbal and written information necessary for life-saving measures), other information sharing, such as completing patient care reports, is done after the event. One respondent explained:

> The patient care report is computerized but they do not always fill it out immediately. Some do it a few hours later and some a few days later and it is worthless by the time they do it. The goal of the patient care reporting system is to provide a legible report of what happened, a medical document that can be referenced both in the short- and long-term. It is used for data collection and quality purposes.

Strengths and weaknesses to the current system range. Since the current patient tracking system is not used on a daily basis, there is a learning gap when it is utilized or it tends to be forgotten entirely. This causes problems when incident-specific information

needs to be shared with staff who are not on the scene and need information quickly so that they can assist with resources and provide crisis communications to the public and family members. Another problem is that one:

> …cannot enter information while the patient is in the ambulance because you cannot enter data and treat patients at the same time. The objective is to get EMS to enter information as soon as possible but saving lives is the primary goal.

Overall, concern was expressed as to how patient tracking will be done once the patient goes beyond the local jurisdiction's authority.

2. Ideal Patient Tracking Process for Emergency Medical Services

The same interview participants also provided their future vision of patient tracking for EMS. Again, the same properties were discussed, examined, and the results can be seen below.

From the EMS perspective on process flow, neither the ***actors*** nor the ***data*** change. What does change is the ***information sharing method***, which leans more toward electronic methods for real-time information sharing. One interview participant stated:

> You could have three modules, the detailed look, the overview look and the tracking portion, which is tracking patient name, age, and priority condition. The overview look just tracks number and priority conditions. The modules can be tailored based on who is viewing them and who has access to the system. Maybe not everyone sees all of the information.

Another interview participant said:

> In New York there are wireless handheld devices with barcode scanners, screens, keyboards with cameras mounted on them. They are used for scanning a patient's triage tag at a hospital, once the patient has been taken there after being treated on-scene.

There were concerns that collecting data electronically may delay life-saving tasks. However, there are several methods capable of achieving both by using technology. For example, handheld devices with drop down boxes can help to speed up data entry. Emergency medical units could also have the option to turn off various fields

during mass casualty events when less information is being collected on the patient. Even telemetry (sending test results through airwaves to an electronic system) could be employed when conducting specific medical tests, which can speed up the data collection process. Voice recognition is another option that could help to speed up the process. It is important to employ "something that could be used on a daily basis that is durable, easy, provides a unique identifier for the whole state, and can be coordinated regionally."

One of the major challenges addressed was that of ***timing***, or *when* the ideal system should be used. It was clear that patient tracking should be used every day, but interview participants were not clear as to how to merge this information into a patient tracking system for nationwide tracking. They saw patient tracking as a two-tiered system. One tier is used real-time by the local discipline, and the second tier is designed to be more nationwide in nature and can be "turned on" when necessary. One participant stated: "The ideal system is on all of the time, but the challenge is to get the system to tie into something that can be used in both disasters and during normal operations."

When discussing the ideal patient tracking system, the researcher asked interview participants about the idea of ***ownership***. One interview participant stated that if there is a nationwide patient tracking system that is multi-discipline and multi-jurisdictional, then no one entity can own the system. There are too many disciplines updating the information. Others believed that state Department of Motor Vehicles could own the identification aspect of the system. One participant said: "We should use drivers' licenses with barcodes as patient tags and standardize the fields so we can all work together. The driver's license and the barcode can be the state and the regional solution rather than a triage tag." Another interview participants believed that the "technology department or the health information network [HIN] should own the system." The participant went on to explain: "[HIN] is the major architecture" that allows information sharing.

Another concept that emerged during the interview process was ***identification***. Identifying a person on the scene was very important because it links a person to important medical information collected on the scene. As that patient travels, identification remains important; it links the patient back to an electronic file. Drivers'

licenses provide a unique number that could achieve this, but other problems arise because not all people, especially children, have state-issued identification cards. Ideally, a patient identification number can be issued on the scene and follow the patient throughout the entire process. One participant stated:

> Barcodes can be used for patient tracking. Without it you are relying on a piece of paper getting there with the person. You need some type of identifier on the person that links them back to their record. If a person cannot speak, a barcode is nice or if you are tracking them through to the morgue. It is easy to use barcode scanners.

C. LEVEL THREE ANALYSIS—EXAMINING THEMES IN INDIVIDUAL IDEAL PATIENT TRACKING MODELS

During the third level of analysis, the researcher analyzed the ideal model and derived three EMS modules. Data, actors, and technology required to exchange information between the various actors are all a part of the EMS modules.

The first module, Emergency Services Module 1, consists of a patient report, which is used to collect data that pertains to the relationship between the patient and the emergency medical technician. It is the detailed patient record. The module needs to be accessible to a variety of actors within the same discipline and also actors that cross disciplines. For example, the EMS authority needs to access EMS Module 1 for quality control purposes. On the other hand, a public health nurse should have access to EMS Module 1 during clinical operations. If a patient gets sick in the clinic, the nurse can pre-enter the information before an emergency medical technician arrives to pick up the patient. This is a time saving measure.

The second module, Emergency Medical Services Module 2, consists of a summary report, which is used primarily by those in command and control positions who need situational awareness. This information can be used to brief the media and high-level officials and can also be used to make quick decisions to support field operations.

The third module, Emergency Medical Services Module 3, consists of a patient tracking report, which is a specialized module that collects information from EMS Module 1 and tells the reader where a patient originated from and to where the patient

was destined. It is important that disciplines responsible for communication to family members and missing persons have access to this module as well as disciplines that are directly responsible for the patient's whereabouts and healthcare.

Although not described in detail here, this exact level of analysis was completed for all of the disciplines. After all of data and disciplines were examined, the result was 17 individual modules. The researcher then graphically displays each model to show interoperability. The researcher also charted the relationship of the actors with each of the modules, showing if the actor provides information into or requests information from the module.

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IV. FINDINGS

Before addressing what a national patient tracking system should look like, it is important to look at the system from the perspective of each discipline involved in the patient tracking. Without on-the-ground operational processes to aid in gathering data from patients in the field, a nationwide patient tracking system cannot be achieved.

This chapter compiles the data obtained from a variety of interviews. It works to develop what a patient tracking system will look like at the local level then shows how these local systems feed into a nationwide patient tracking system. The chapter starts by defining patient tracking. It then moves into the various emergency support functions by defining the general purpose of each ESF and discussing the various disciplines associated with each ESF. The disciplines' role in patient tracking is also summarized. Current process flows for each discipline are provided as well as ideal process flows, focusing on the actors involved, data collected, and how those data are shared.

It should be noted that every discipline within the United States with the same responsibilities listed below may not utilize the same operational processes. Due to federalism, states are independent entities, and as a result, come to different conclusions about operational processes. However, by looking at current processes, it is possible to develop an ideal patient tracking concept that could be used nationwide without altering individualized and localized processes around the country. This nationwide patient tracking system will be the final model in this chapter.

A. DEFINING PATIENT TRACKING

> Patient tracking is not just about moving people, it is about knowing what a person needs so you can make a decision about a person in a quick and organized way. (Anonymous, 2009)

"Patient tracking is about people tracking. It makes no sense to separate the two" (Anonymous, 2009).

Patient tracking is an operational process that follows a patient from Point A to Point B to Point C and so on. Patient tracking should not be restricted to just patients. Patient tracking is a very broad term because Americans access the healthcare system frequently as they move in and out of the healthcare system. Patient tracking should include methods to track all people during emergencies as they move through various services. The most important aspect of patient tracking is that is it done in real-time and that the information is provided to responders in a usable way so that they can make decisions and unify families. The goal is to find people.

B. ESF 8: PUBLIC HEALTH AND MEDICAL SERVICES

1. Definition of ESF 8

Federal, state, and local public health authorities are the lead agencies responsible for public health and medical services. These public health authorities are responsible for working with EMS, hospitals, and the private healthcare system to ensure preparedness. Often times when a response is required by these entities, direct patient care is provided. Patient care is administered in medical-needs shelters, while evacuating patients, in hospitals, out in the field, and in clinical operations during mass dispensing/vaccination operations.

2. Public Health

One of public health's main functions is to dispense medication or administer vaccines during an emergency with public health consequences. For example, a pandemic influenza event would require the public to be treated with antivirals or prophylaxed with vaccinations. An anthrax event would require the dispensing of antibiotics. To provide this service, public health agencies open mass dispensing and vaccination clinics designed to increase the throughput of patients. Public health clinics can process thousands of patients per hour.

Public health agencies are interested in patient tracking for two reasons.

- They need to account for patient care.
- They need know patient destination.

a. Patient Flow in Mass Dispensing/ Vaccination—Current Process

Upon entering a mass dispensing/vaccination clinic, the patient is triaged by designating him or herself as healthy or sick. A sick patient will proceed down one line to get appropriate treatment and a healthy patient will proceed down another line for medication. A healthy patient fills out a form to communicate personal *information* including demographics (i.e., name, address, and age) and medical history (i.e., pregnancy and allergies). Registration personnel either help the patient with these forms or will enter the information into a computer if available.

Once the registration paperwork is completed, the healthy patient takes the form, either handwritten or printed (if the information was taken by computer), to dispensing where the nurse reviews important medication information and determines the best mode of care. Medications are dispensed or vaccines administered. The nurse collects the initial patient registration form and documents care provided on the form. The forms are then collected by clinic administrators who tally total numbers. Later, individual patient information is entered into a patient record database.

Once the healthy patient receives treatment, he or she is given documentation of medical care administered and instructions for further care if necessary. The healthy patient is discharged, and dependant on the event, the healthy patient may be asked to return for follow-up care (i.e., some vaccines require a follow-up dose after a certain period of time has lapsed).

On a regular basis (i.e., hourly), the total number of patients served is sent to the public health EOC for situational awareness. This is generally done through email or fax. In addition, the CDC may ask that information regarding vaccine administration be uploaded to a CDC-required database for tracking purposes. This is especially true if the CDC believes there is an epidemic or pandemic and has provided the medication/vaccine to be administered. Again, this is currently done during clinic operations but not in real-time since the initial information exchange between the patient and the registration staff and nurse is handwritten.

For patients that enter a mass vaccination clinic but have been triaged as sick patients, a vaccine cannot be administered because they are already sick. Rather, the sick patient is transferred to a medical treatment clinic held within the same facility and will await transport to the hospital. Before transport occurs, the sick patient will verbally communicate their signs and symptoms of illness to the nurse. The nurse will document patient care on a written form and will include demographics, vitals, medical history, and any treatment the nurse may have provided to the patient while awaiting transport. Once transport arrives, the form along with the sick patient will be transferred to the responding EMS unit, which will administer further care if needed during transport to the hospital. The process flow for the healthy and the sick patient can be seen in Figure 3.

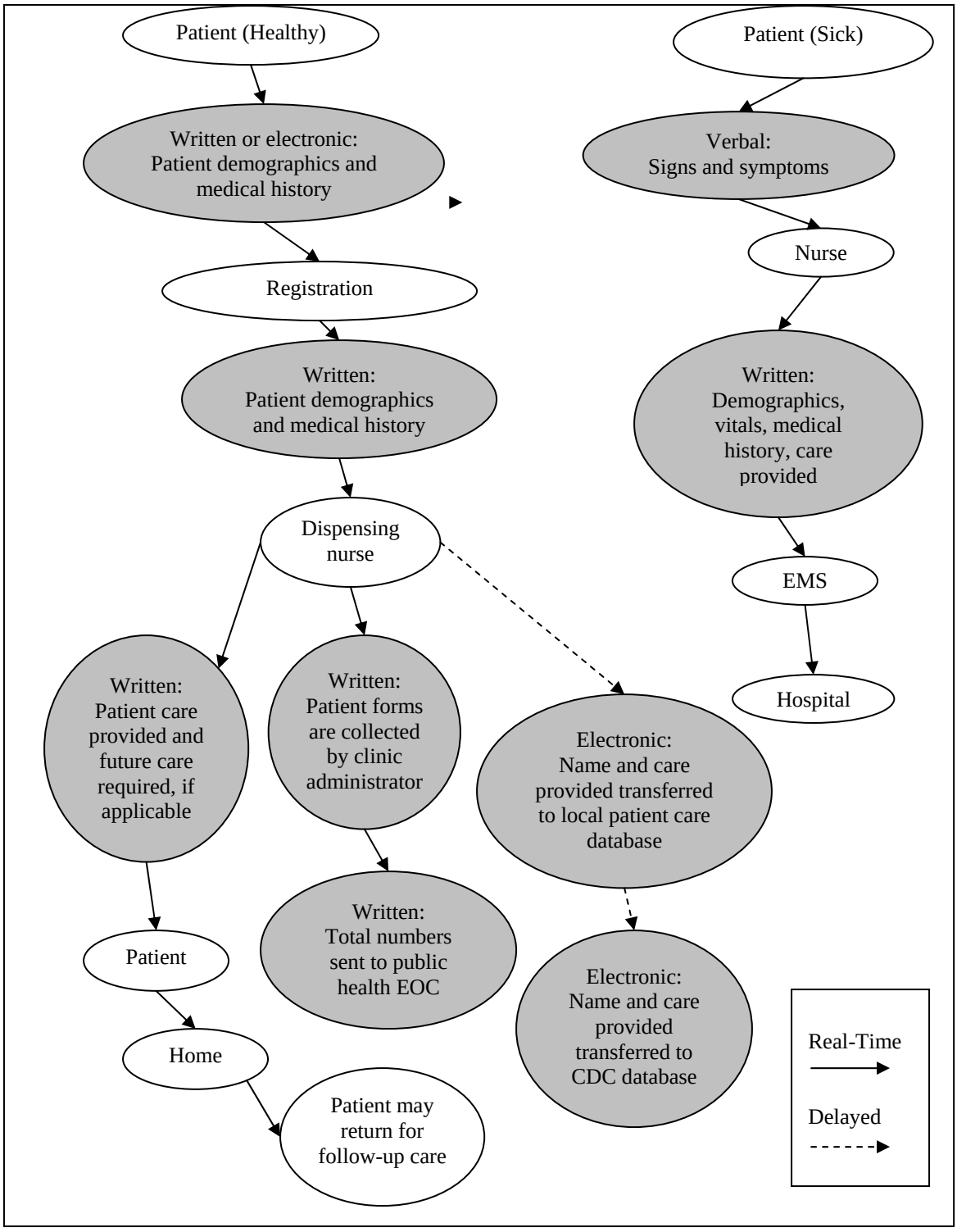

Figure 3. Patient Flow in Mass Dispensing/Vaccination—Current Process

b. Patient Flow in Mass Dispensing/Vaccination—Ideal Process to Increase Capability to Track Patients

When infusing patient tracking into the mass dispensing/vaccination process, it is important to not change the key parts of that process because each aspect is basic and necessary. By improving the accessibility, reliability, and transmission between the various stations in the clinic as well as with the command and control personnel overseeing the clinic it is possible to achieve patient tracking.

In the ideal model, once the patient enters, registration will be performed and patient demographics and medical history will be collected as usual. This information is important because it impacts that type of medication/vaccine that should be administered when considering allergies, pregnancy, and/or age.

Identification is important when a person enters a public health mass dispensing/vaccination clinic. Staff must ensure that the person registering is the same person receiving care. As the patient moves from station to station, the patient needs to keep the same identity. This can be done by issuing a barcode.

Once the patient information is collected by registration, a barcode will be printed and placed on a ticket and handed to the patient. The patient will then move to dispensing and the nurse will scan the barcode using a handheld computer. The patient's information will be displayed, and the nurse will confirm name and important medical information using the handheld computer. If evidence-based treatment algorithms are programmed into the system, the system can recommend treatment; however, the nurse should have the ability to override the system's decision if need be. If the nurse agrees, he or she can click accept, and the system will register the treatment recommended and subsequently provided. If the nurse does not agree, she or he will tell the system and then enter the treatment actually provided. If computerized evidence-based treatment algorithms are not used, the nurse will make a medical decision and document care.

In some cases, the patient must return to the clinic to receive follow-up care (i.e., some vaccines require two shots, the second after a certain number of days). When the patient returns, he or she can bring his or her original ticket with the barcode

and bypass dispensing. The nurse will scan the ticket, verify the information, and administer the second dose. For returning patients who lost their tickets, they can proceed to registration and get another ticket. However, it is important to link that person to the initial patient care record.

Consideration can be made to use state-issued picture identification rather than barcoding. The picture identification is certainly the most culturally appropriate method of identifying a person and can also be scanned to retrieve demographic information. However, if the patient does not have a state-issued identification in his or her possession, this is problematic. In this case, the public health authority should consider issuing its own form of identification so it is certain it is providing follow-up care according to initial care provided.

Three software modules should be employed to achieve patient tracking. The first module, entitled Public Health Clinic Module 1: Patient Care, will be the detailed medical record of the patient. This detailed patient record can interact with CDC databases and local immunization databases. Written documentation of medical care administered and instructions for further care, if necessary, will still provided to the patient.

The second module, entitled Public Health Clinic Module 2: Summary Report, is the overview report that includes the total number of patients served and the total number of treatments/vaccines provided. This information can be retrieved by the public health EOC that will then provide it to the media, governors, legislatures, fusion centers and other incident-specific organizations. The EOC may also use the information for planning purposes to determine percent of population seeking treatment/prophylaxis and the total amount of medication/vaccine stockpile used.

The third module, entitled Public Health Module 3: Patient Tracking, is the tracking portion of the system. This module can be used by the public health call center if follow-up care is needed (i.e., a follow-up vaccine as is required in some cases). Using this module, the public health call center can easily determine who received the first administration of the vaccine and if the patient returned for follow-up care. If not, a call center associate can contact the person.

At mass dispensing/treatment clinics, it is also important to assist those who are sick when they present. When a sick patient enters a clinic, he or she may need to be transferred to a hospital for treatment. The patient will not go to registration or dispensing. At this point, the nurse acts in a triage manner, much like an EMS unit acts in the field during a mass casualty event. The nurse will collect the patient's demographics, medical history, and signs and symptoms. All of this information will be entered into EMS Module 1: Patient Care. The system will provide a barcode, which will be placed on the patient. When the EMS unit arrives at the clinic, it can scan the barcode to retrieve patient information already collected by the nurse and can expand that record. The patient will then be processed and tracked in accordance with the ideal methods stated in the EMS section of this chapter. Through EMS Module 3: Patient Tracking (to be further described in the EMS section of this chapter) authorities can report on how many patients were picked up from the clinic and transported to a hospital. The ideal process flow for the healthy and the sick patient can be seen in Figure 4.

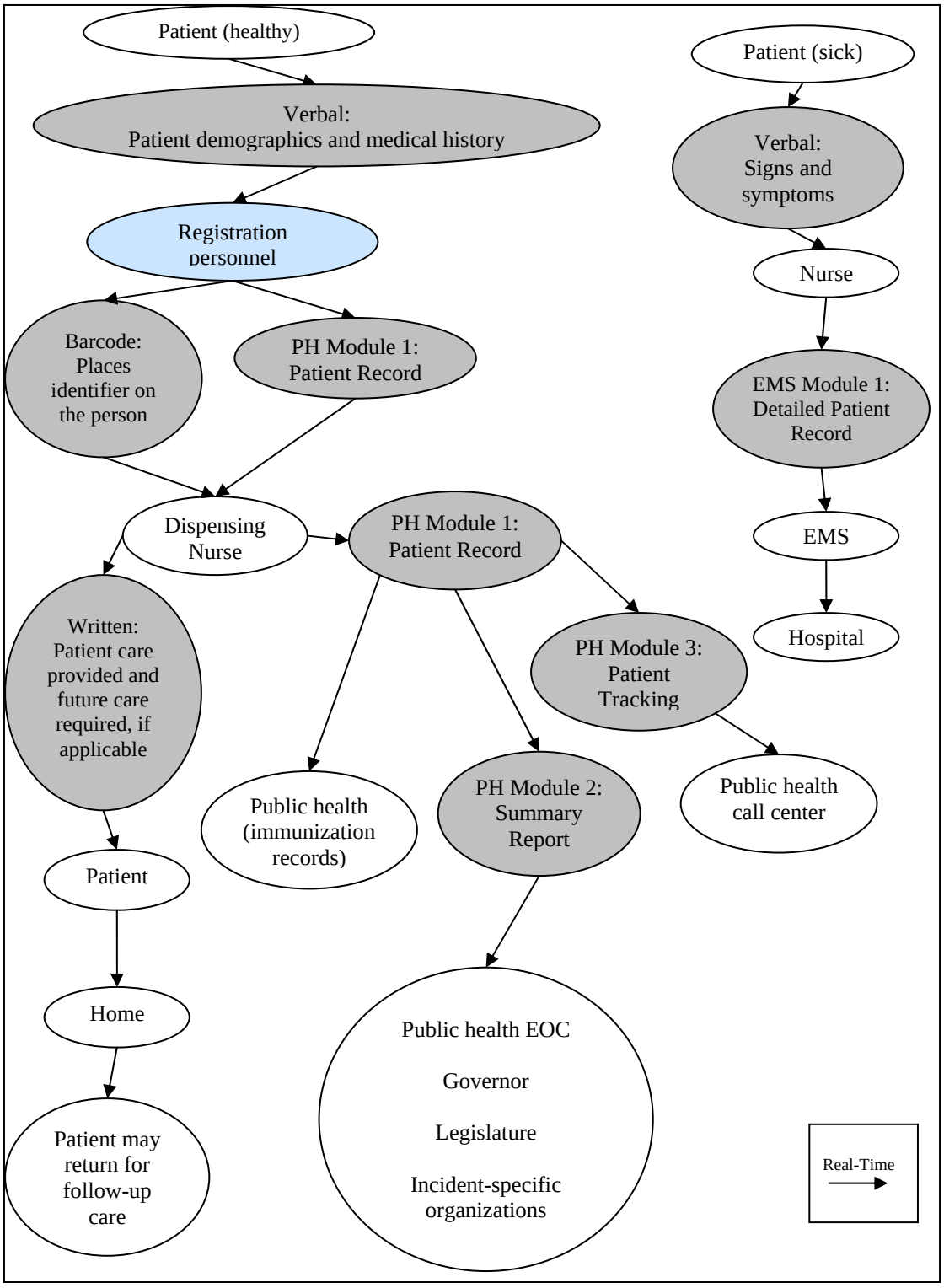

Figure 4. Patient Flow in Mass Dispensing/Vaccination—Ideal Process

3. Emergency Medical Services

EMS serves under ESF-8 during a disaster event. The main function of EMS is to provide medical care to critical patients in the field and to transport those patients to hospitals for treatment. EMS responds to events where only one person needs assistance and events that require the treatment of multiple people.

EMS personnel are interested in patient tracking for two reasons:

- They need to account for patient care.
- They need to know patient destination.

a. Patient Flow in Field-Based Casualty Care—Current Process

Depending on the event, different operational processes may be used by EMS to provide critical care in the field. During day-to-day operations, EMS will only respond to assist a few people. However, in a disaster, their responsibility expands to include tens, hundreds, and sometimes thousands of people needing critical care in the field. The process flow shown in Figure 5 describes the general flow used in a mass casualty event.

The process begins with a member of the public or a potential patient calling 911 dispatch. If the potential patient is calling, this person will verbally provide her or his physical signs and symptoms of trauma. If it is a member of the public or an observer of an event, the person will provide detailed information about the incident itself. The 911 dispatcher will enter all of this information into an electronic system. He or she will prioritize the event, assign a case number to the event, and may add a suffix if there are multiple victims (note that there is not always a statewide unique number assigned). The dispatcher will then assign resources (i.e., EMS unit or police officers) to the event. In this case, the resource is an EMS unit.

When resources are assigned, the EMS unit will receive the information initially provided to the 911 dispatcher verbally over the radio and will also receive the information electronically on the unit's local computer. The EMS unit will tell the

dispatcher that it is in route and will provide the arrival time, all of which are also captured in the electronic system. If the EMS unit needs additional resources, it will contact the 911 dispatcher to provide the resources.

When the EMS unit reaches the patient, the two will discuss verbally the initial complaint and the signs and symptoms of trauma. In a mass casualty event, an identifier will be placed on the person in the form of a triage tag, which will note the person's demographics; his or her condition and vital signs; and will designate a priority, such as minor, delayed, immediate; and his or her destination point.

If there are multiple patients at the scene, an on-scene command center will be activated to organize the response. The commander will verbally provide summarized information, such as total number of patients as well as the sex and the age of individual patients, to hospitals by radio so that the hospitals may prepare for the incoming surge of patients. The individual EMS units may also verbally contact the hospitals to let them know they are in route and to get orders from the hospital physician for treatment in route (note that EMS units are not licensed to prescribe medication). Once the EMS unit arrives at the hospital, it verbally provides all necessary patient care information including results of any treatment provided in route. The EMS unit then removes the triage tag from the person, notes the destination point for tracking purposes on the tag, and later submits the tag to the commander on scene. The patient is then entered into the hospital system.

After the response, the EMS unit will inform the dispatcher that it is available for the next call. The EMS unit will also prepare a patient care report, which electronically documents the entire incident and the care provided. This report may be completed immediately, hours after the event, or sometimes days after the event. The report is sent electronically to the public health authority's electronic health emergency reporting and surveillance system through the health information network so that the public health authority can monitor any aberrations and trends in illness. A written report is also sent to the hospital to be placed in the patient's medical record. An electronic copy will go to the state EMS authority so that it may monitor quality of care and service; improve response; and, depending on the size of the incident and the activation of state

EOCs, the authority may be responsible for providing situation briefings to the governor, legislature, and other incident-specific agencies and organizations.

At times, it is possible that local EMS units cannot handle the number of causalities in the field and will need to request assistance. The state's emergency management agency will request resources from other counties, states, or through FEMA. EMS units will respond to the area and will work under the authority of the state's EMS agency. These resources should easily plug into the local system. However, to do this, they will need resources to communicate.

During planned events (i.e., presidential inaugurations), additional EMS units may be requested from the Department of Defense (DoD). DoD can supplement medical staff in the field. These resources, again, will simply plug into the local system. They will also need resources to communicate.

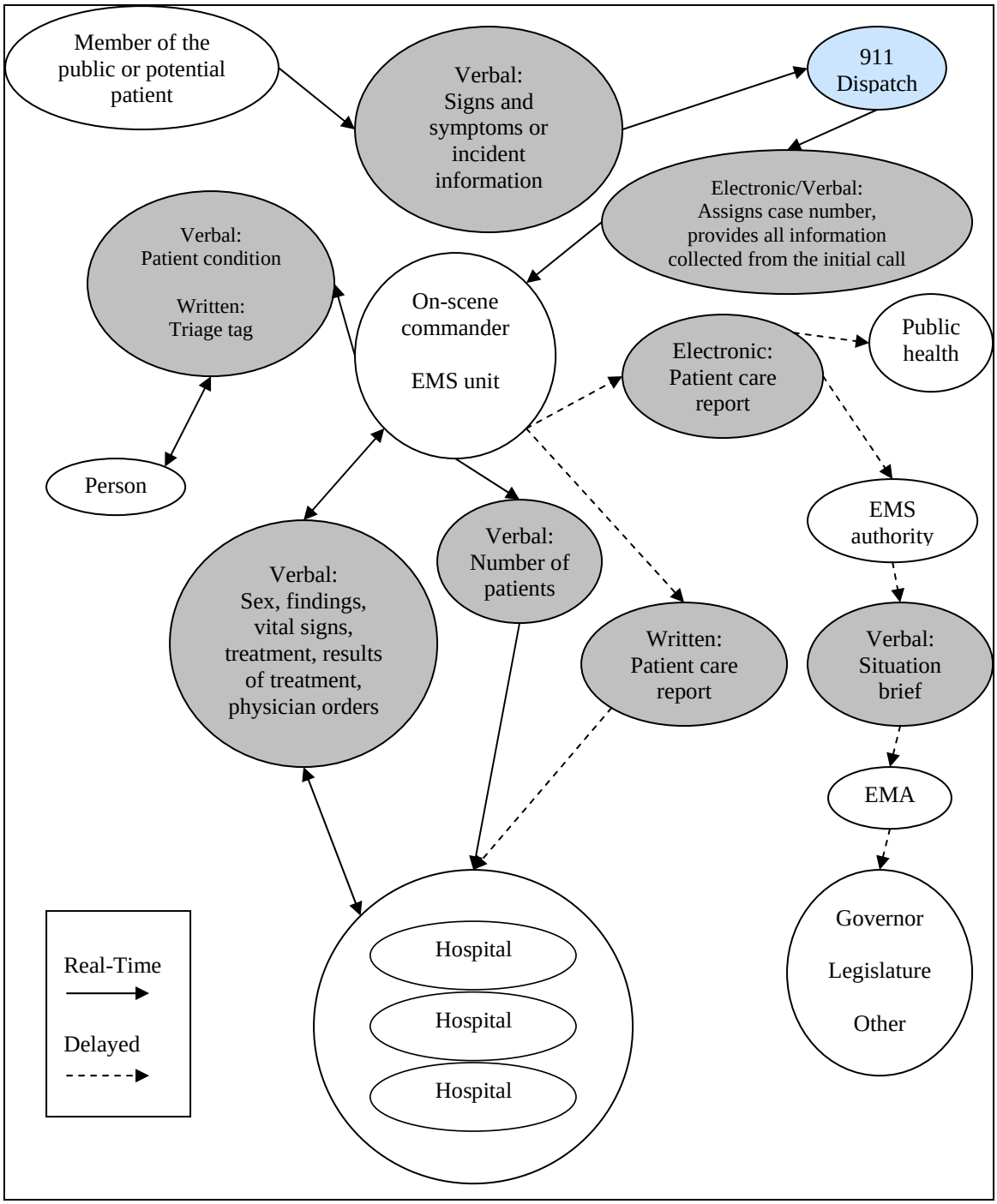

Figure 5. Patient Flow in Field-Based Casualty Care—Current Process

b. Patient Flow in Filed Based Casualty Care—Ideal Process

The ideal process is somewhat similar to the current process with some modifications. This process can be seen in Figure 6. The call comes into the 911 dispatch and the person provides signs and symptoms or incident information. The 911 dispatcher enters the information into the electronic system and provides a unique statewide case number, which will ensure that duplicate case numbers are not created. The unique number will allow the state EMS authority to track the cases statewide, rather than causing confusion between counties.

Once the EMS unit reaches the patient, patient care information should be captured electronically during the time of care rather than after the care is provided. First, since information from the 911 dispatch report is already electronic, that information should present on a handheld computer device and verified with the patient. This will save the EMS unit time in entering information like demographics and complaint. The system should also be tied to a health information system so that important diagnoses (i.e., diabetes or seizures) can be discovered quickly and medical care can be provided adequately. Ideally, an alert will be present on the computer that quickly points out the patient's important diagnoses and how that person is being treated for the condition. This will all need to be available in a user friendly manner so as not to impede the immediate care that needs to be provided to the patient.

Second, the handheld device should have the capability to print a small barcode sticker and can be placed on the triage tag. The barcode will correlate with the case number originally assigned by the dispatch. So now, the actual person is linked to the full electronic record from both dispatch and EMS.

Identification can also be achieved in other ways, but these may pose some additional challenges. State issued identification (i.e., driver's license) can be used because it has unique numbers and barcodes already located on it. If this is done in the field, then the information will then need to be transferred back to 911 dispatch unit if the dispatcher was unable to get the information on the call.

Using a state issued identification poses a few other challenges. One, not everyone has state-issue identification, most notably children. This means that the EMS unit will still need to create an identifier to be placed on the person. A second challenge is physically placing the state-issued identification on the person so that it can be easily accessed to scan the barcode when the patient's record needs to be updated. There is no practical way to attach it, meaning that every time it needs to be scanned it must be located in a pocket or purse. A possible attachment method could be placing it in a lanyard.

Third, any new information collected on the patient needs to be entered into the handheld computer to continue the patient care report. By scanning the barcode, the EMS unit can retrieve that patient's care report, and as the EMS unit is providing care, the information is entered into the computer. A priority can also be assigned to the patient.

While entering this information can be a challenge during the time of care, (note that the first priority is to provide care, and the second priority to document care provided), this can be facilitated by utilizing computer-based methods of capturing patient care data. For example, personnel can perform some lab tests if field personnel have the capability of entering the results automatically and wirelessly into an electronic system. Or the system can be so user friendly with drop down boxes, which takes less time to click on than typing in the information. Or, voice recognition technologies can be employed. This patient care record can be accessed by the hospital physician, who can then enter treatment orders that can be seen by the EMS unit providing the care. Response to the treatment will also be collected electronically. And when the patient is taken to the hospital that destination is once again noted by using the handheld electronic system.

Documenting such information electronically while providing care would be a major change in the way the EMS system does business. Again, the system needs to be a simple system so that it can not only be used during an event by local EMS units, but

so that EMS supplemental staff through regional or national means can pick up the system easily with little just-in-time training. A stockpile of additional handhelds will need to be available for these added staff.

In a mass casualty event, when EMS on-scene commands are activated, an ideal system will take the detailed information being collected in the field and will summarize it for the on-scene commander so he or she can get a snapshot of the patients in the field. This summary report will include the identification number, the age of the patient, and the patient's priority. On-scene commanders can then begin to assign destination hospitals within the system for each patient based on the level of care needed. A bed tracking system, commonly used by hospitals today and will be entitled, Hospital Module 1: Bed Tracking, can be accessible by the on-scene commander so that he or she knows the number and type of beds available at each hospital so appropriate assignments can be made.

This EMS summary report can also be accessible by the hospitals electronically rather than the on-scene commander providing the information verbally since the information is constantly changing. Thus, the hospital will know that it is getting 10 priority-one patients and six priority-two patients and can begin to prepare the emergency room. This information can also be accessible by the EMS authority and emergency management agency so they can begin to address concerns from the media, governor's office, legislature, and other incident-specific agencies affected.

In the end, the system will employ four modules that can be accessed depending on need. The first is the detailed information on the patient, EMS Module 1, Patient Report. This can be retrieved by the EMS authority, EMS units, on-scene commanders, hospitals, primary care providers, and public health. The second is the summary report, EMS Module 2, Summary Report, that includes a listing of patients by identification number, age, and priority and can provide the total number of patients that is also sub-aggregated by priority. Hospital bed availability can also be displayed in this module so that the on-scene commander can begin to assign destination points. This can be retrieved by the EMS authority; public health; and emergency management agencies that will provide it to governors, legislatures, and other incident-specific organizations;

EMS units and commanders; hospitals; and fusion centers. The fourth is the tracking portion, EMS Module 3, Patient Tracking, that can be sub-aggregated by hospital and will include the patient's name. If the fourth module is employed, this will relieve the burden on hospitals when families contact them to find their loved ones. Families can then be given a call center telephone number where customer service representatives can tell them which hospital the patient was sent. This module can also be retrieved by EMS authorities, EMS units, on-scene commanders, emergency management agencies, and public health agencies.

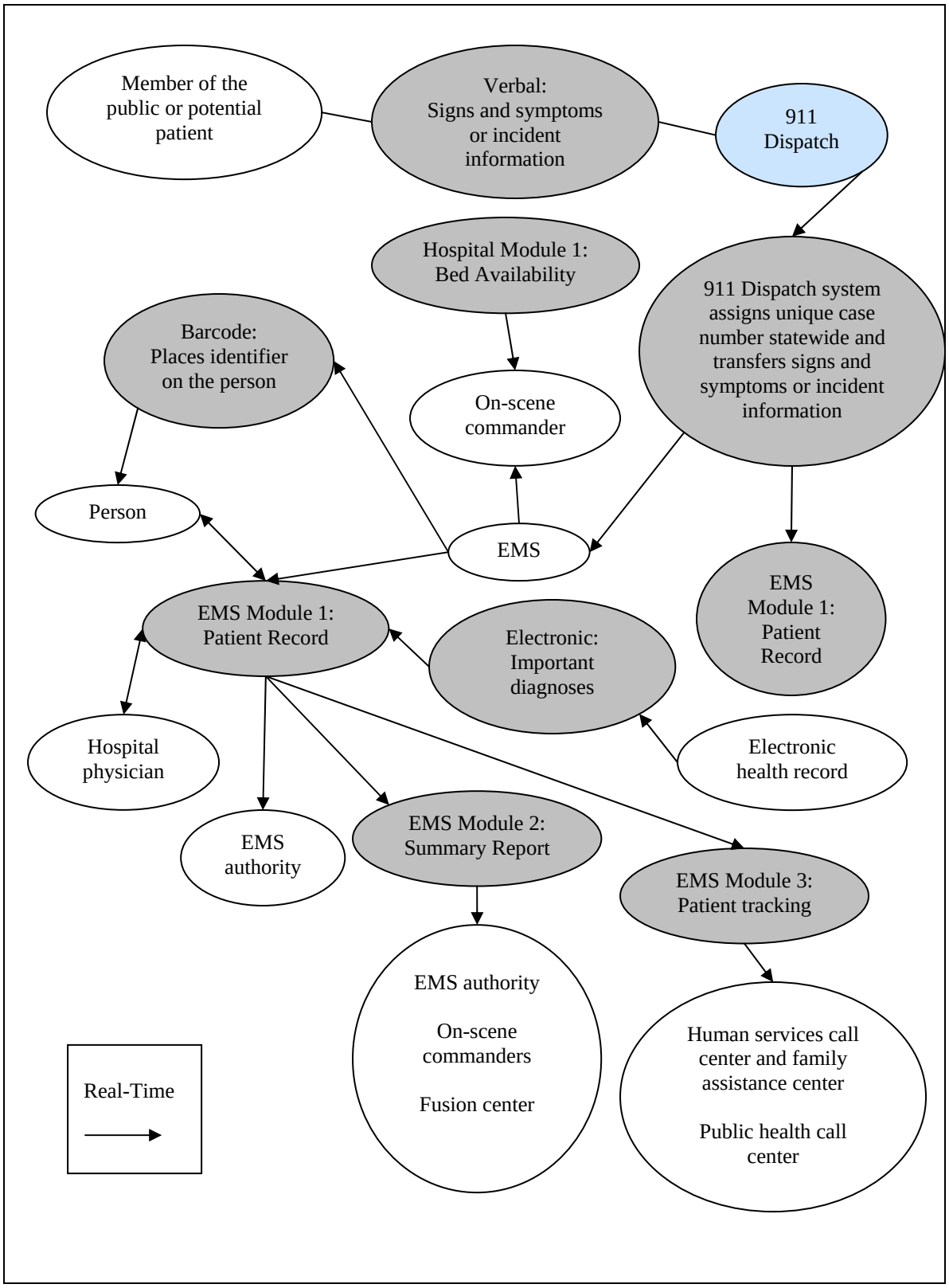

Figure 6. Patient Flow in Field-Based Casualty Care—Ideal Process

4. Hospitals

Hospitals play a major role in disasters and serve under ESF-8. They must not only be prepared to deal with medical surge but must also be able to evacuate, sometimes in a moment's notice. Either way, patient tracking is important to hospitals because it allows them to monitor patients on the scene of an event, prior to arriving at the hospital, so that they may prepare for the influx. In a hospital evacuation, tracking allows them to know the final destination of their patients. While this is not a requirement for hospitals to know the final destination of patients, since liability transfers to the evacuation authority, it is important to the overall process and to those that are responsible for such information.

a. Patient Flow as Hospitals Receive and Evacuate Patients—Current Process

This section will be divided into two separate processes. The first will be receiving patients and the second will be evacuating patients. Each of these processes has a very different process flow that needs to be examined in detail.

(1) Receiving Patients. This process, as detailed in Figure 7, starts with a mass casualty event in the field and includes EMS units. The beginning of the process is the same as discussed in the EMS section above and will not be repeated in great detail. However, the hospitals' perspective and duties will be highlighted in this section. In addition, detailed patient tracking within the hospital will not be addressed as the primary point of this paper is to capture destination point.

Once a mass casualty event occurs, EMS units report to the scene. When the on-scene commander gets an idea of the scope of the event, he or she will contact the hospitals through radio communications and tell them the number of patients they can expect and the age of each patient. Generally, the emergency department nurse will receive this communications and will activate a triage area staffed with triage nurses.

Hospital triage is a mobile concept and can be set up anywhere in the facility depending on the type of event or the number of patients arriving. If patients

are contaminated, the triage will be set up outside. Nonetheless, triage nurses must balance the number of patients arriving with the number of available beds so that patients needing care are not waiting and can actually receive care. This is done in conjunction with the emergency room nurses. Bed availability is also provided to the on-scene commander to help them determine if patients should go to other hospitals for care.

Upon arrival of the patient to the hospital, the EMS unit will provide a verbal and written report of the patient's condition, the patient care provided, and how the patient responded to treatment. The patient is then transferred to a room where he or she will be cared for by a doctor. After the event, the EMS unit will provide a formal patient care report and that will be placed in the patient's hospital medical record.

In the early stages of the event, families hearing about the mass casualty event on the news begin to contact or appear at the hospital wanting to know if their loved one is there and if he or she is okay. If the patient is still on the scene, the hospital does not always know where the patient will be sent to. The on-scene commander may know or may still be working on where to send patients. Or he or she may simply assume that the patients will go to the nearest hospital and may communicate that to the media or family members. However, the closest hospital may be on divert and not accepting any patients.

Nonetheless, depending on the number of casualties, a rather large number of people will present at the hospital emergency department and/or call the hospital. If they present at the emergency department, the nurses do not have enough time to address the concerns of the families because they are busy dealing with patient care issues. Families can become frustrated. Once the event has slowed, the hospital will address family concerns, and families may find that their loved one is not located at the hospital they have gone to. The hospital will then begin to place calls to other hospitals to locate the patient or refer to patient lists that have been faxed between the hospitals for this purpose.

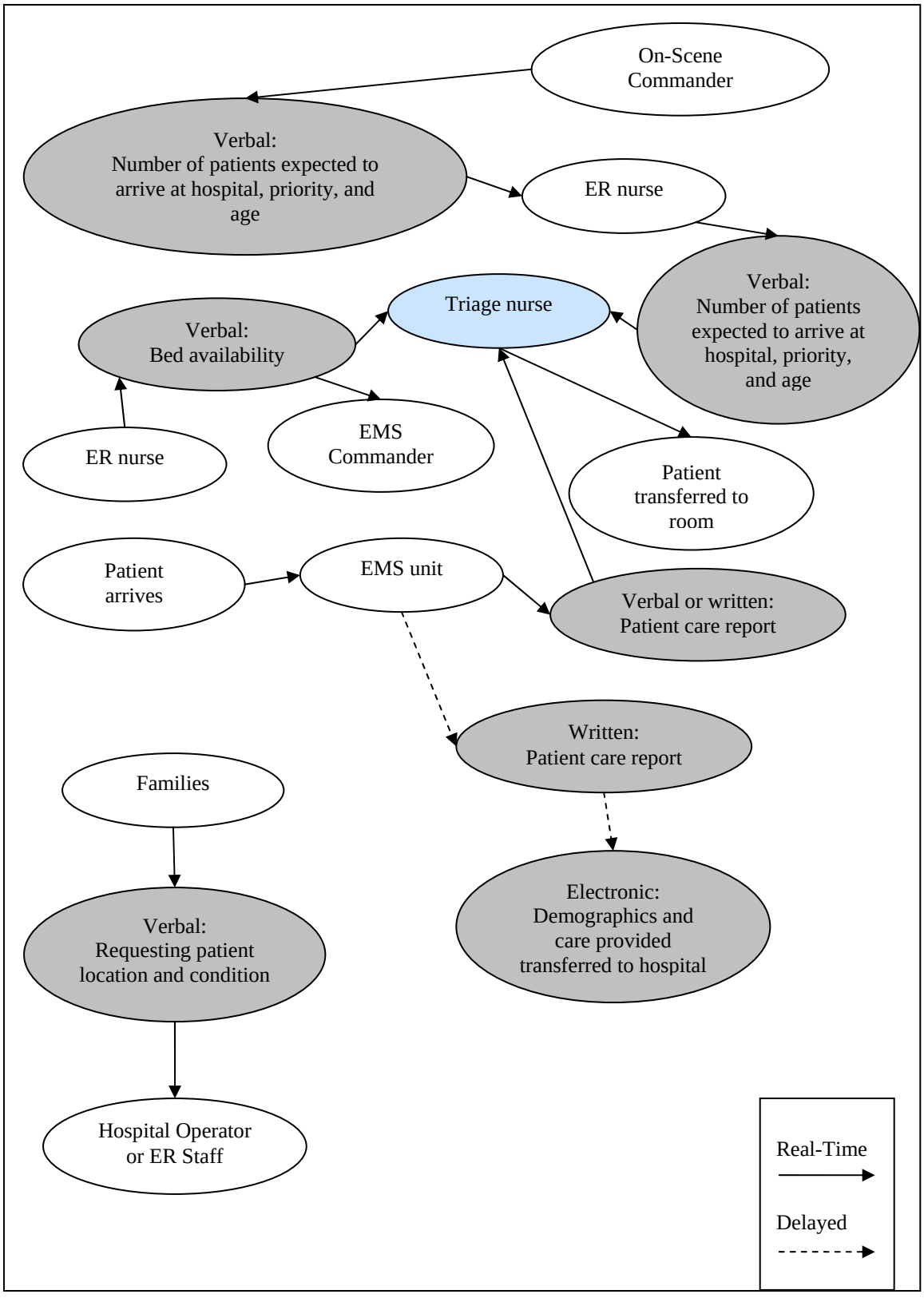

Figure 7. Patient Flow as Hospital Receive Patients from the Field—Current Process

(2) Evacuating Patients. Evacuating a facility is, in some ways, the reverse process of receiving patients. There are two types of evacuations that can occur. The first is when only one hospital in the locality is affected and patients can be transferred to other hospitals within that same locality, assuming that there is available bed space. The second is when a region is affected and multiple hospitals need to be evacuated outside of the region.

In the first scenario, a localized event, the hospital would determine which patients should be evacuated first and will ask surrounding hospitals for their bed availability. Paper-based medical files will be prepared and attached to each patient. They will bring the patient to the triage area where an EMS unit will pick them up. The evacuating hospital will note the number of the EMS unit taking the patient for its own files.

If the event is a statewide event, it will not be possible to transfer patients to other hospitals within the state. Federal assistance will be requested through the state's emergency management agency. The National Disaster Medical Systems (NDMS) will be activated to help to transport patients. NDMS will also find available beds at NDMS-affiliated hospitals throughout the nation. Rather than EMS units (most likely in a case like this, both local and regional EMS units will be employed) taking patients to local hospitals or field facilities, the EMS units will take the patients to a staging airhead where they will be airlifted by the DoD. The patient will be transported to a receiving airhead and provided ground transportation to a hospital, where he or she will be received and treated accordingly.

Since there currently is no method to track patients, although some are in the process of being tested, there is no way to know where patients were actually taken. As a result, re-entry teams are used to contact NDMS-affiliated hospitals to get a list of patients located at each. This information will eventually reach the family members of each patient.

In either of these events, families will be hearing of the event through the media. Calls will begin to come into the hospital. The hospital will have to, after the event, inform the families of the location of their loved ones. For a figure of this process flow, see Figure 8.

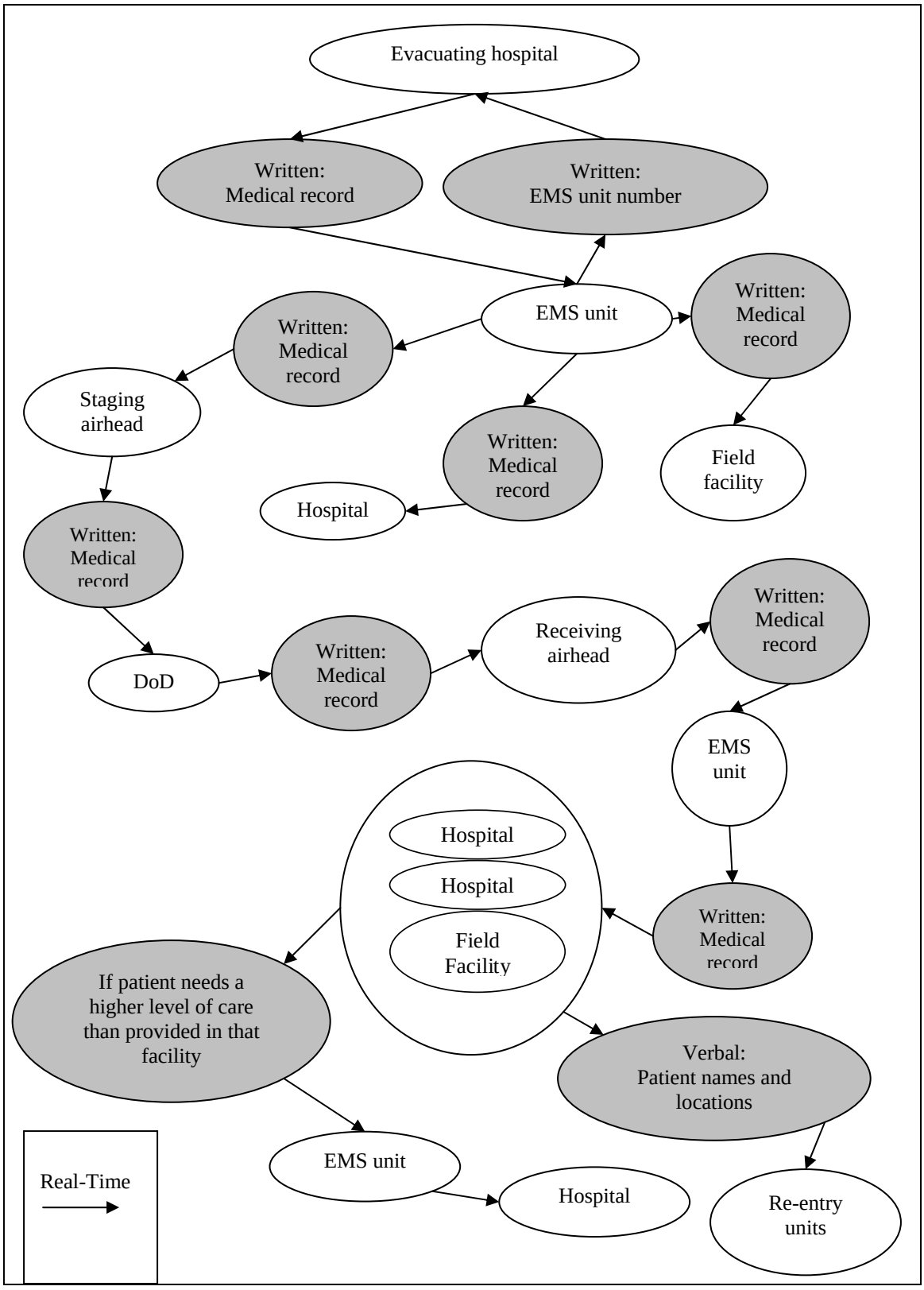

Figure 8. Patient Flow as Hospitals Evacuate Patients—Current Process

b. Patient Flow as Hospitals Receive and Evacuate Patients—Ideal Process

(1) Receiving Patients. Since the emergency room nurses and triage nurses need to know the number of patients they can expect to receive and any identifying information, hospitals should have access to the EMS Module 2: Summary Report that can provide them that information electronically rather than verbally. This information can then be displayed on a handheld computer device so that the triage nurse can access it at any location. The information should also be made available to the hospital EOC, which will be responsible for controlling emergency room resources. If they know how many patients will be coming, they can begin to recall staff for additional assistance.

The same is true for the public health EOC. It, too, can begin to project what resources can be provided if needed. Likewise, if the fusion center has the information, it can provide situation reports to all public safety partners so they are aware of the event.

EMS Module 1: Patient Report should also be shared with the emergency room physician, triage nurse, and other nurses in case they want to see individual detailed patient data. By scanning the barcode the EMS placed on the patient, this information will be accessible to hospital staff so they can begin to treat the patient. EMS units can also provide verbal briefings if necessary.

Bed availability should be a new module created specifically for the hospitals. This module, entitled Hospital Module 1: Bed Availability, was previously discussed in the EMS section of this paper. The module will allow the hospital to input bed availability and will sub-aggregate by bed type. It should be noted this module only shows the bed availability for local hospitals and does not show the bed availability for nationwide hospitals as this is the responsibility of NDMS. The module should be available to the hospital EOC so that it knows when to begin to get authorization to place the hospital on divert. It should also be available to the public health EOC so that it can project when it will need to find additional beds outside of the locality.

So that loved ones do not begin to call the hospital, emergency management will need to inform the families through the media to contact a call center to obtain information about their loved ones. The call center should be operated by the public health authority since it is responsible for ensuring that the needs of hospitals are served in an emergency. The call center will need to be activated quickly, with little time delay, since mass casualty events are fast-breaking and families will want to know the status of their loved ones as soon as possible. These customer service associates will need access to EMS Module 3: Patient Tracking to tell the families where the patient was taken. Consideration should also be made to use a Hospital Module 2: Patient Tracking, which shows who is currently admitted to each hospital since casualties may not use EMS to enter the hospital but may walk-in instead. For a figure of this process flow, see Figure 9.

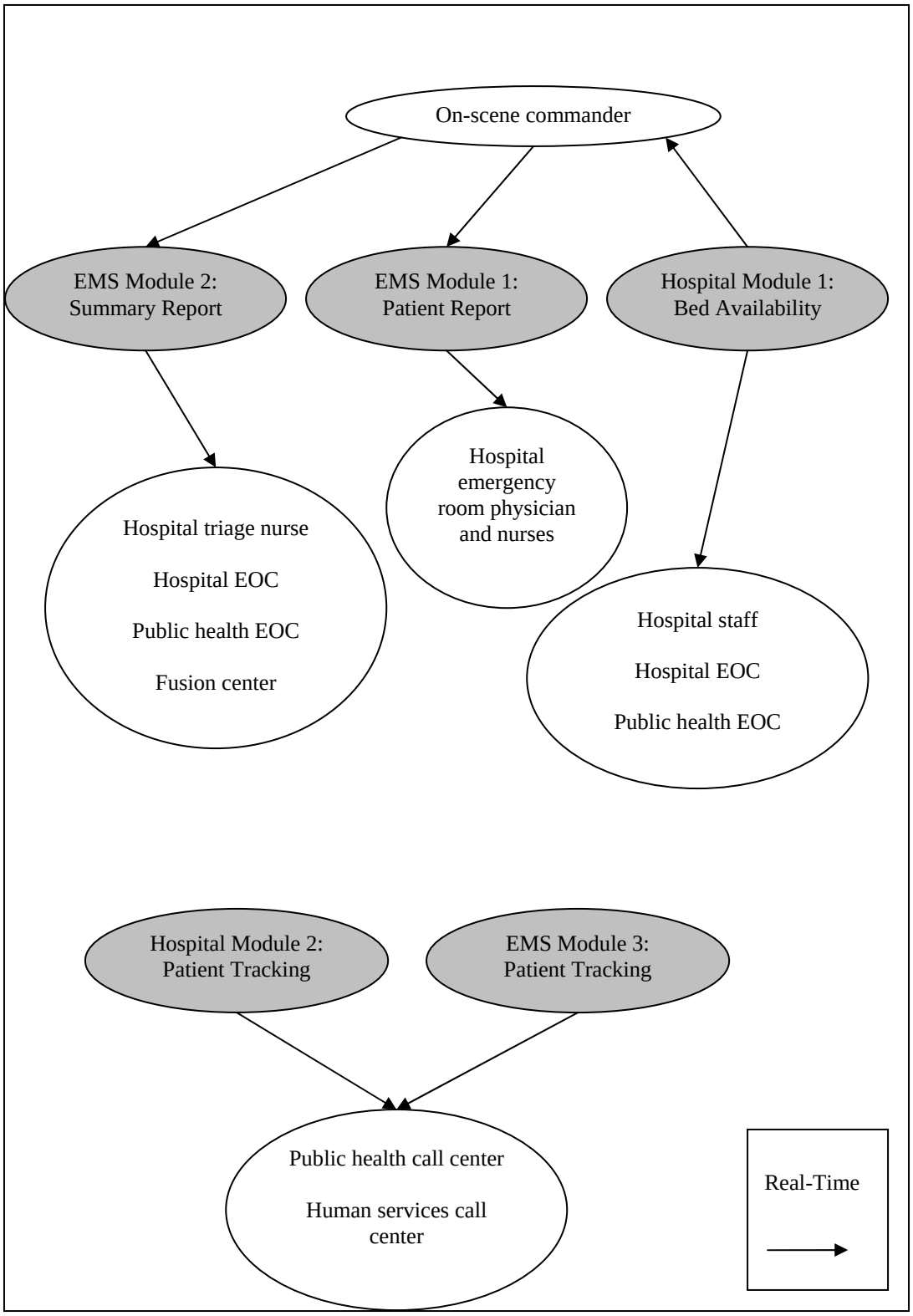

Figure 9. Patient Flow as Hospital Receive Patients from the Field—Ideal Process to Increase the Capability to Track Patients

(2) Evacuating Patients. By introducing new methods of sharing information, patients can be tracked locally and regionally as they transfer from one point to the next. In more complex events (i.e., a regional evacuation), patients may be required to go to multiple points and will be touched by a number of organizational entities as they move from point to point. This information can be captured in different localized systems but then needs to be merged in order to capture the full scope of patient transfer. By merging the information, point of origin is ultimately linked to the patient's final point of destination. By operationalizing patient tracking in this manner, a single patient tracking database does not need to be used by every entity within the country.

The first aspect of tracking should be done at the point of origin. When local EMS units arrive at the evacuating hospital, they should be equipped with the system noted in the EMS section that allows patient care reports to be captured electronically including points of origin and destination. If possible, it would be ideal to scan the wristbands of the patients to begin the care report and extract any information housed on the wristband. Otherwise, each patient will need to be have a barcode.

This information will then be available in the three modules previously noted, one being the patient tracking module. This will provide information as to what destination the patient was taken, which could be a local hospital or local airhead where the patient will be transferred outside of the jurisdiction.

During a regional evacuation, once the patient is at the airhead, he or she becomes the responsibility of the DoD under the NDMS, a federal mechanism to transfer patients outside of the region to other hospitals. DoD can either scan the hospital wristband or EMS barcode. If this cannot be done, DoD will have to place a barcode on the patient.

To achieve tracking, a system should be utilized entitled Department of Defense Module 1: Patient Tracking and should be made available to DoD medical personnel. The DoD system may certainly employ more detailed patient reports as EMS does in a DoD Module 1: Patient Care Report and the patient tracking data can be pulled from those reports as is done with the EMS patient tracking module.

When the patient is put onto the airplane, the patient's name and origination point can either be retrieved from the medical record attached to them, if legible, or the patient's hospital wristband can be scanned to retrieve this information. The electronic record should be updated with the plane number and any care provided during transport. A new barcode can be issued and placed onto the patient. When the airplane reaches the airhead at the other end, the barcode is scanned and the point of destination is noted. This information will need to be captured with handheld computers and is similar to that employed by EMS units, as DoD airplanes are essentially another EMS unit.

Once the patients land at the receiving jurisdiction's airhead, the receiving EMS units will need to transport them to a receiving hospital. Again, if previous barcodes or wristbands can be scanned, they should be or new barcodes will need to be created. If receiving EMS units employ the same modules as noted in the EMS section, the point of origin and destination will be captured electronically. Note that by separating the sending EMS unit's and the receiving EMS unit's systems, both EMS units have the freedom to localize their systems to meet their own needs while, at the same time, meet the needs of patient tracking. The only important data fields that need to be employed are point of origin and point of destination. These data fields are commonly used in the EMS system already.

As can be seen, there are a number of points the patient has passed through during a regional evacuation. The sending hospital is point one, the sending airhead is point two, the receiving airhead is point three, and the receiving airhead is point four. EMS units, whether ground or air, are capturing the information individually. Now, the information needs to be merged for the purposes of patient tracking. By utilizing a middleware, a new module can be created entitled National Disaster Medical System Module 2: Patient Tracking. The middleware would pull data from DoD Module 1: Patient Tracking and EMS Module 3: Patient Tracking. The NDMS module would allow a query by patient name and the report would provide the various transfers that took place per patient. This would also be useful for local public health call centers or human services call centers and family assistance centers when families call to locate

their loved ones. Or, a sending hospital could query its hospital and find a listing of its evacuated patients and where they went. The module would have to be web-based so that entities nationwide could access it. For a figure of this process flow, see Figure 10.

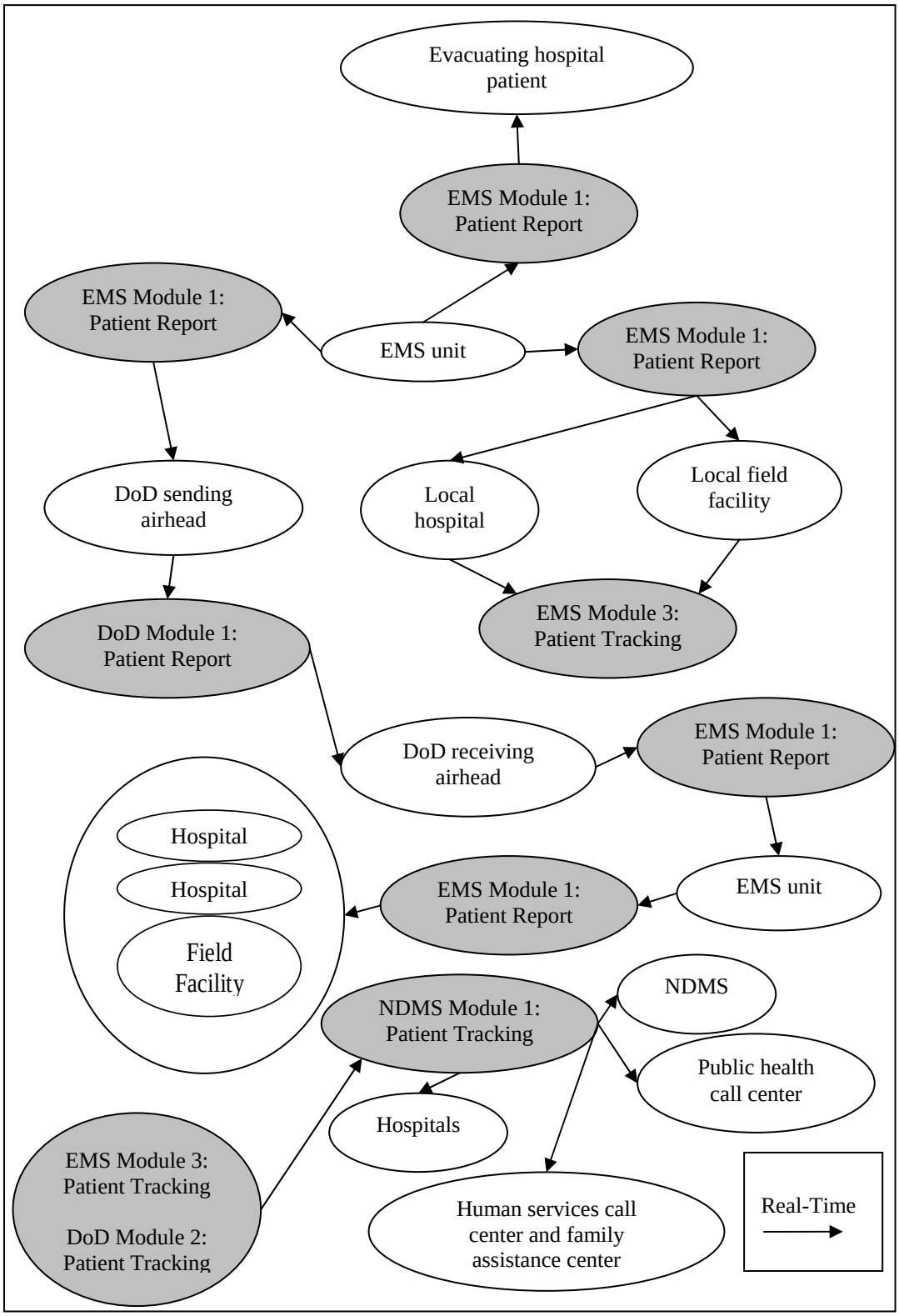

Figure 10. Patient Flow as Hospitals Evacuation Patients—Ideal Process to Increase the Capability to Track Patients

C. ESF-13: PUBLIC SAFETY AND SECURITY

1. Definition of ESF-13

ESF-13 is responsible for "force and critical infrastructure protection, security planning and technical assistance, technology support, and general law enforcement assistance in both pre-incident and post-incident situations" (Department of Homeland Security, *ESF-13 Public Safety and Security*, 2008, p. ESF #13–1).

2. Law Enforcement

Law enforcement agencies are mainly interesting in tracking missing people, which can include missing patients, if loved ones do not know where the patient was taken. Disaster victims are all susceptible to becoming "lost" in the system, whether it be through shelter misplacement or evacuation. Law enforcement's function is to be able to find these people once they are reported as missing and report back to the original missing person report submitter. Since law enforcement is responsible for tracking all missing persons and are not just patient oriented, the term missing persons will be used rather than patient when discussing tracking. However, a family member may report a patient as missing if the hospital is unable to locate them during evacuation.

Law enforcement personnel are interesting in tracking for a number of reasons:

- They need to collect reports on missing persons.
- They need to locate missing persons.

a. Law Enforcement's Flow of Missing Persons Information—Current Process

Missing persons is another difficult aspect to manage when faced with a catastrophic emergency. If the emergency entails a manifest (i.e., an airline manifest where ticket holder names are captured and it is clear who is on the plane) missing persons is not a real issue. However, if the disaster is more widespread, these useful tools cannot be employed. Depending on the disaster, tens of thousands of calls reporting

missing persons becomes hard to manage, and law enforcement agencies must deal with the increase in reports and subsequent investigations to locate these people. The ultimate goal is to locate the person and get that information back to family members for the purposes of reunification.

The process begins when a concerned person calls 911 dispatch to report someone missing. Information regarding demographics of the missing person and where he or she was last seen and other personal identifying information is collected and entered into an electronic missing persons report. Depending on the type of person missing and the event, a broadcast to all law enforcement agencies will be conducted. Either way, the information is electronically transferred to the appropriate law enforcement agency to begin the formal investigation process. A detective will perform a field investigation by talking to people and obtaining information from various electronic sources. Updates are saved electronically or in paper-based files. The assigned law enforcement agency also transfers the information to the National Crime Information Center.

During a disaster, thousands of calls come in and many may have no evidence whether or not their family member is actually missing. Some calls are simply derived from panic. As a result, each missing person report needs to be evaluated. The more reports received, the longer it will take to evaluate, prioritize, and assign to a formal investigation. For a figure of this process flow, see Figure 11.

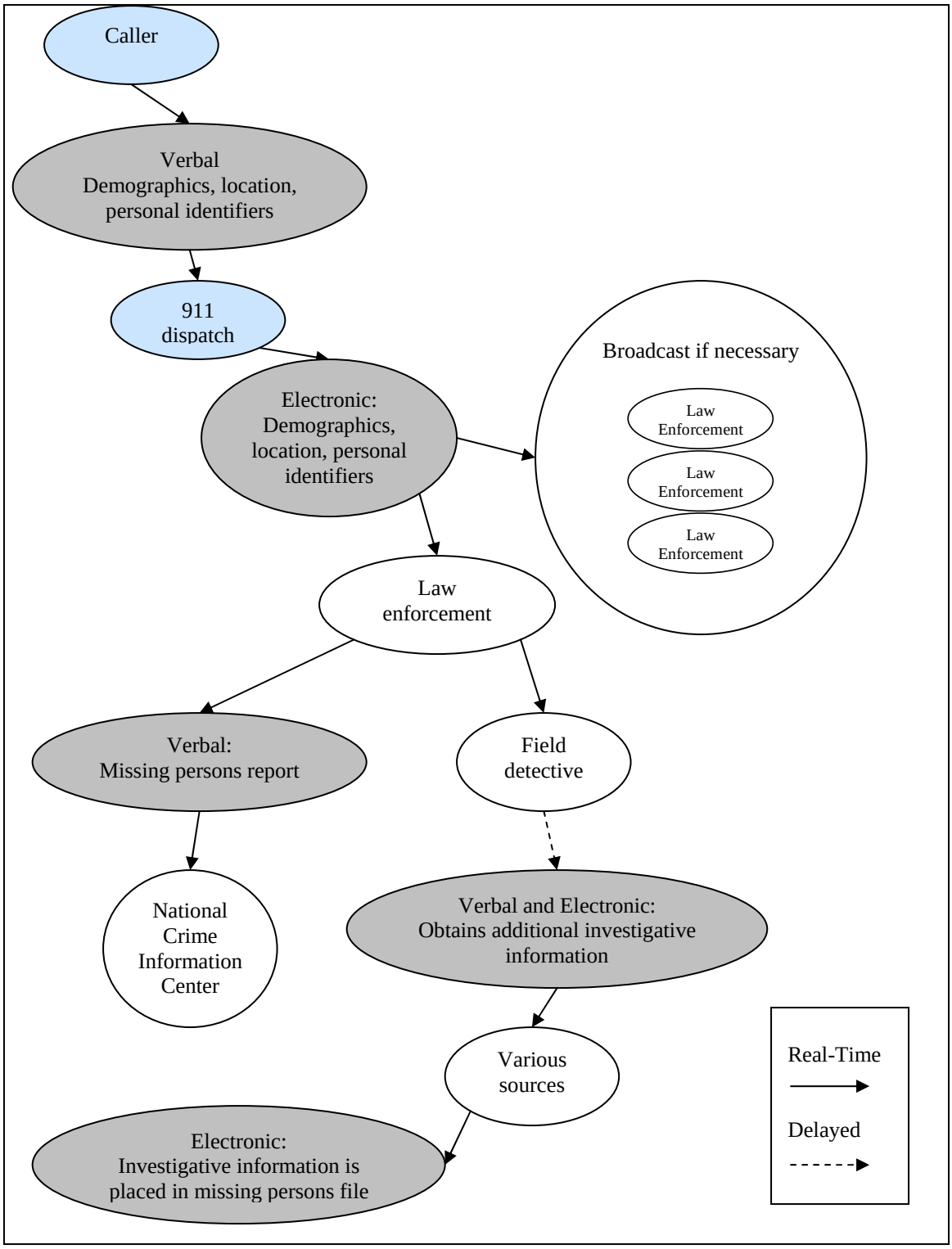

Figure 11. Law Enforcement's Flow of Missing Persons Information—Current Process

b. Law Enforcement's Flow of Missing Persons Information—Ideal Process

To enhance the missing person's process, especially in a catastrophic event, information should be centralized. Many people in disasters are only temporarily misplaced, not truly missing. However, this difference is not noted by the public.

In a catastrophic disaster, call centers and walk-in family assistance centers should be available to collect "missing persons" information and assist with family reunification. This will alleviate calls coming into 911 dispatch units, which will be busy assisting with disaster operations. When a concerned family member calls or walks into the center, he or she can provide his or her concern to the customer service associate, who will capture information in an electronic missing persons entitled Missing Persons Module 1: Client Report. The name of the caller along with contact information will be retrieved as well as the name of the missing person, demographics, and any information that may help to identify the patient (i.e., place last seen, clothes worn).

The customer service associate will have access to all of the various tracking modules noted in this section but the information will be displayed in a module entitled Missing Persons Module 2: Client Tracking through a middleware. Since the modules do not provide a unique patient identification number statewide or nationwide to each person served, the customer service associate will need to identify a person using a variation of demographics. It is much easier to find someone if his or her name and age, or name and city, or name and zip code are entered into the system as one queries. This will streamline the results and help the user to identify the person in question. The middleware will search the various patient tracking modules and will provide a summary of the locations and dates the person presented. The system will need to have a query feature so the customer service associate can enter the person's name.

If information can be found on the missing person, the customer service associate can then assist the person with reunification, or if information cannot be found, a missing persons report can be created. The filed can be accessed later by the customer service associate, since new information will be available on an on-going basis. If the

file cannot be closed prior to the deactivation of the call center or family assistance center, the file will then become accessible to the local law enforcement agency that will follow up with a missing person's investigation post-disaster.

If no information about the missing person can be found, the missing person case will need to be investigated. Based on the information provided by the caller and because the number of reports may be extraordinary, customer service associated will need to prioritize the reports accordingly. For example, if the caller states that he or she is not sure if the loved one is in the affected area, this report might have the least level of priority if further investigation is required.

Specialized policies will certainly need to be developed when employing this type of system. For example, a state may not want to tell a caller that the person they are trying to locate is dead if the person was found to be at the medical examiner's office. The customer service associate should be able to categorize certain statuses found so that the appropriate entity can follow up accordingly (i.e., personal visit).

It should be noted that, while missing persons is the responsibility of law enforcement during times of normal operations, during a disaster the focus switches to family reunification. If reunification cannot be achieved, then it becomes a missing person's issue. Family reunification is the responsibility of ESF-6 Mass Care, Emergency Assistance, Housing, and Human Assistance. Therefore, ESF-6 should be responsible for the activation of call centers and walk-in family assistance centers. For a figure of this process flow, see Figure 12.

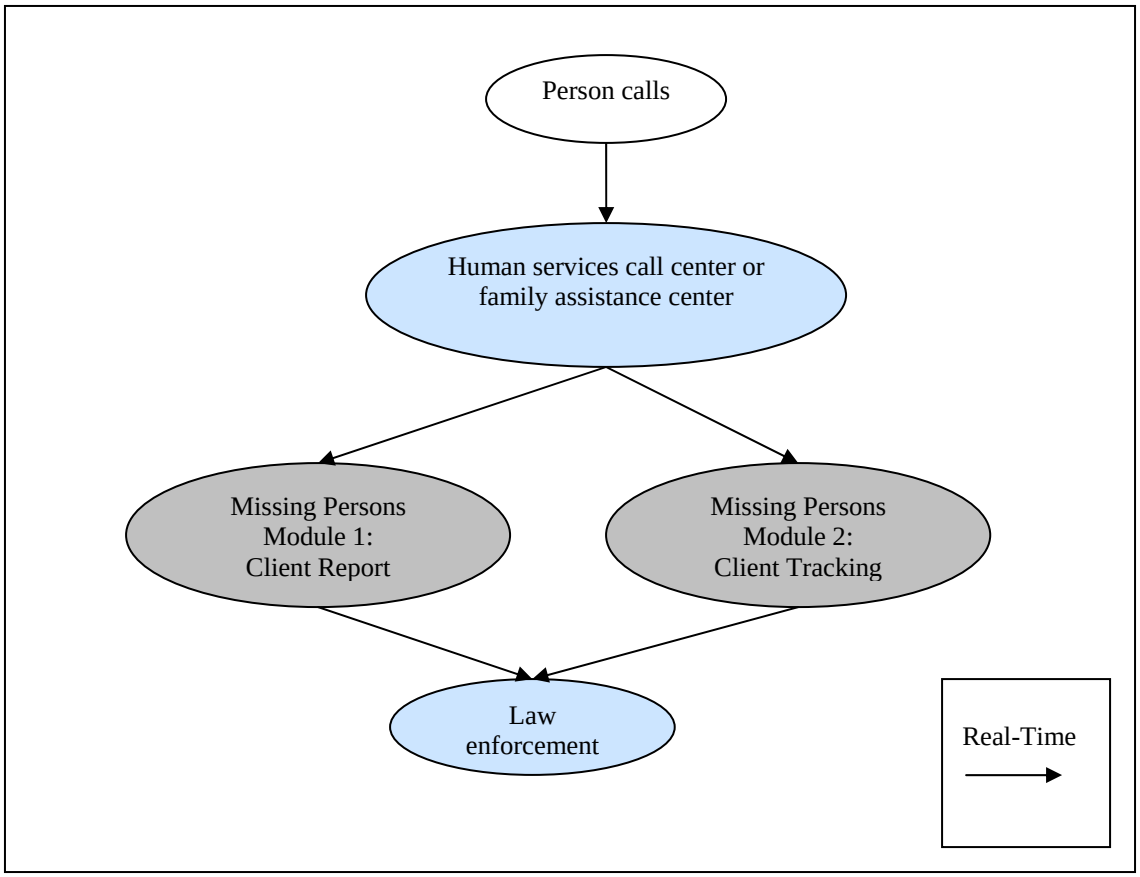

Figure 12. Law Enforcement's Flow of Missing Persons Information—Ideal Process

D. ESF 6: MASS CARE, EMERGENCY ASSISTANCE, HOUSING, AND HUMAN SERVICES

1. Definition of ESF-6

Mass care and human services organizations have four primary responsibilities in disasters.

- **Mass Care:** Includes sheltering, feeding operations, emergency first aid, bulk distribution of emergency items, and collecting and providing information on victims to family members.

- **Emergency Assistance:** Assistance required by individuals, families, and their communities to ensure that immediate needs beyond the scope of the traditional "mass care" services provided at the local level are addressed. These services include: support to evacuations (including registration and tracking of evacuees); reunification of families; provision of aid and

services to special needs populations; evacuation, sheltering, and other emergency services for household pets and services animals; support to specialized shelters; support to medical shelters; non-conventional shelter management; coordination of donated goods and services; and coordination of voluntary agency assistance.

- **Housing:** Includes housing options such as rental assistance, repair, loan assistance, replacement, factory-built housing, semi-permanent and permanent construction, referrals, identification and provision of accessible housing, and access to other sources of housing assistance. This assistance is guided by the National Disaster Housing Strategy.

- **Human Services:** Includes the implementation of disaster assistance programs to help disaster victims recover their non-housing losses, including programs to replace destroyed personal property, and help to obtain disaster loans, food stamps, crisis counseling, disaster unemployment, disaster legal services, support and services for special needs populations, and other federal and state benefits (Department of Homeland Security, *Emergency Support Function #6*, 2008).

2. Human Services

Human services are provided to disaster victims in a variety of forms. Only one main service will be discussed here: sheltering. Sheltering comes in three forms. The first is sheltering of people in the general population, which is generally the responsibility of human service organizations like the American Red Cross or the state human services department. The second is sheltering people in the general population with medical needs, which is the responsibility of the public health authority in coordination with other stakeholders. The third is sheltering in the form of long-term care facilities, which is also the responsibility of the state human services department and the long-term care facilities themselves with the assistance of many other stakeholders.

a. Human Services' Flow of Client Information—Current Process

When a general shelter is activated, clients present themselves at the shelter and register at a registration desk. This tracks who has entered the facility. When clients leave, they are required to sign out. All of this is done through registration forms and is not a complicated process.

The same is done with medical needs shelters. When clients present at a shelter with medical needs, they are registered. Once within the medical needs shelter, they are then assisted by trained medical staff. Patient records are kept to assist with the administration of care. When the client leaves the shelter, they check out.

Sheltering for long-term care facilities is much different. The needs of these facilities range greatly based on the needs of the resident they serve. Some long-term care facilities have residents that are ambulatory and can still perform every day functions like cooking their own meals and driving their own cars. Other facilities house dementia and Alzheimer's residents, who can be non-ambulatory and are more like patients than residents and require a higher level of care. Either way, sheltering is required for these residents during times of disaster, and it is important that their shelter location be tracked since they can end up at any number of destination points including multiple other long-term care facilities unaffected by a disaster, hospitals, general shelters, and medical needs shelters. They can also be transported by EMS, by the state transportation agency, or through private vehicle means. Currently, the only form of tracking done is by attaching medical records to the patient so that when the patient arrives at the receiving facility, the administrators there know who the person is. For a figure of this process flow, see Figure 13.

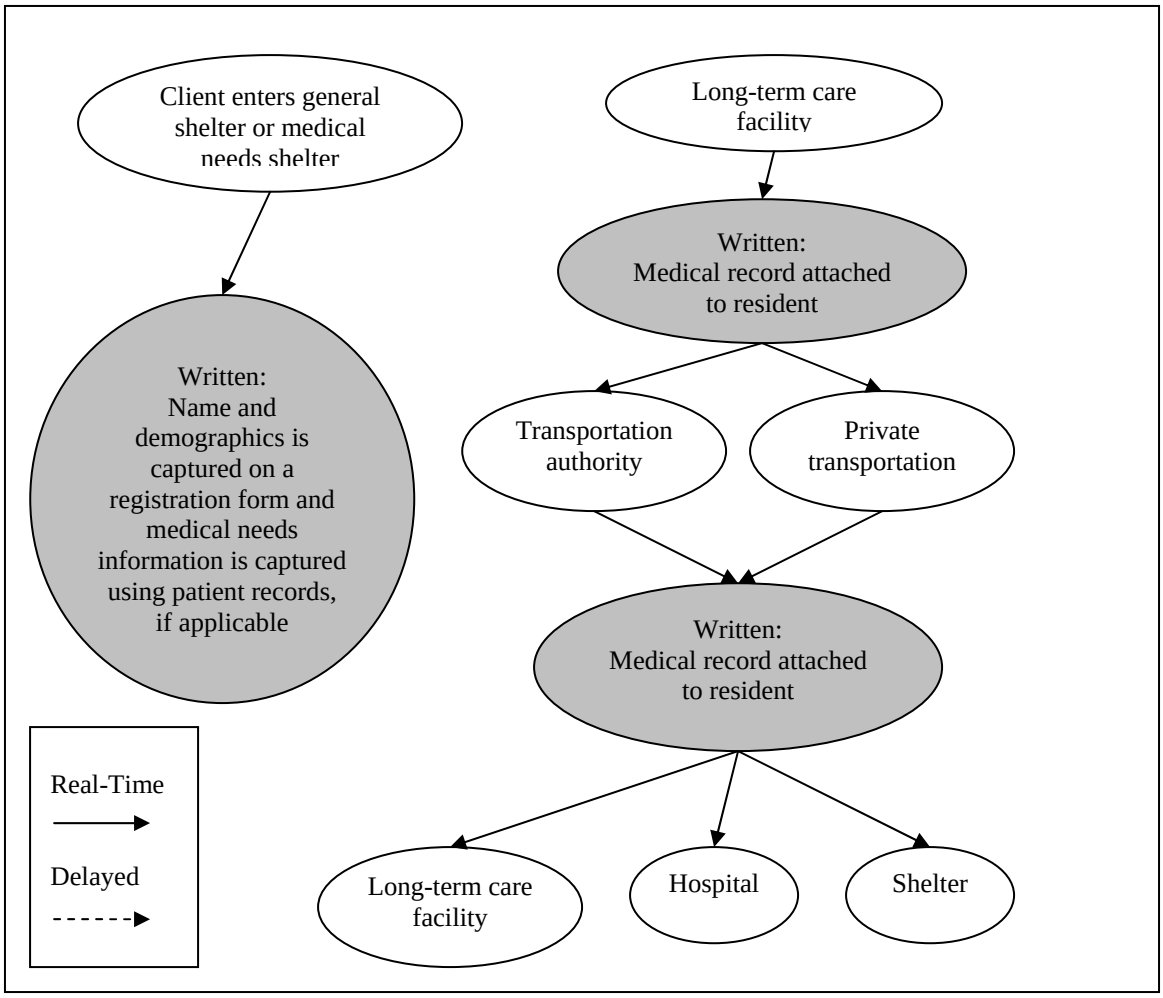

Figure 13. Human Services' Flow of Client Information—Current

b. Human Services' Flow of Patient Information—Ideal Flow

When addressing tracking for shelters, for both general population and medical needs, a fairly simple process can be utilized. Upon registration at the shelter, an identification bracelet can be issued. When the client exits and re-enters the shelter, the bracelet should be scanned to capture movement. This will be entered into an electronic database. All of this information will be captured by Social Services Registration Staff via handheld computers with barcode creators and wristbands so they can create the barcode bracelets and barcode scanners to capture the movement.

Three modules will be useful when assisting with the various information needs. The first module, entitled Shelter Module 1: Client Report, will provide a listing of the names of each person in the shelter, address and phone number, and the location and type of shelter at which he or she is staying. Date of admission and date of check-out will also be captured. For those with medical needs, the diagnosis (i.e., oxygen dependant, feeding tube, etc.) of the patient can also be captured.

The second module, the Shelter Module 2: Summary Report, can include the total number or people in the shelter or occupied beds, a total number of remaining beds, and a total number of people with specific diagnoses. When utilizing the summary report module, the information can be sub-aggregated by field in order to meet the analytical needs. For example, a total number of beds occupied report will also sub-aggregate by shelter location, shelter type, and patient diagnoses. This module should be accessible by EOCs so they can provide updated and accurate information to the public about shelter space.

Shelter Module 3: Client Tracking will take basic information from Shelter Module 1 to achieve the goal of tracking the person. This module will capture the clients name and can be sub-aggregated by location. This module should be available to the entity responsible for tracking disaster victims for the purposes of family reunification.

Tracking of long-term care residents is complicated due to the number of long-term care facilities within any one jurisdiction. It should be noted that many long-term care facilities have privately-owned transportation assets and memorandums of understanding to transfer their residents to partner facilities. This grassroots preparedness removes the burden off the local governmental organization that would become extremely overwhelmed if it had to address the needs of a large number of long-term care residents in an emergency. These facilities can certainly develop their own tracking systems similar to the one proposed here; however, point-to-point transfers are much easier to track as long as relationships are binding. However, in the event that the local governmental organization must intervene, the following methodology should be utilized.

When long-term care residents need transport by a governmental organization, the residents could be checked-in and checked-out of the transport vehicle. This can be accomplished by issuing a barcode bracelet with the person's name and point of origin. When the resident is taken to the point of destination (i.e., general shelter, medical needs shelter, or another long-term care facility), that bracelet can be scanned and updated with the destination point. All of this information will need to be captured using a handheld computer that can issue and read barcodes. This module will be entitled Transportation Module 1: Client Tracking and it will capture the client's name, the transportation unit number, the point of origin, and the point of destination. This module should be available to the entity responsible for tracking disaster victims for the purposes of family reunification. For a figure of this process flow, see Figure 14.

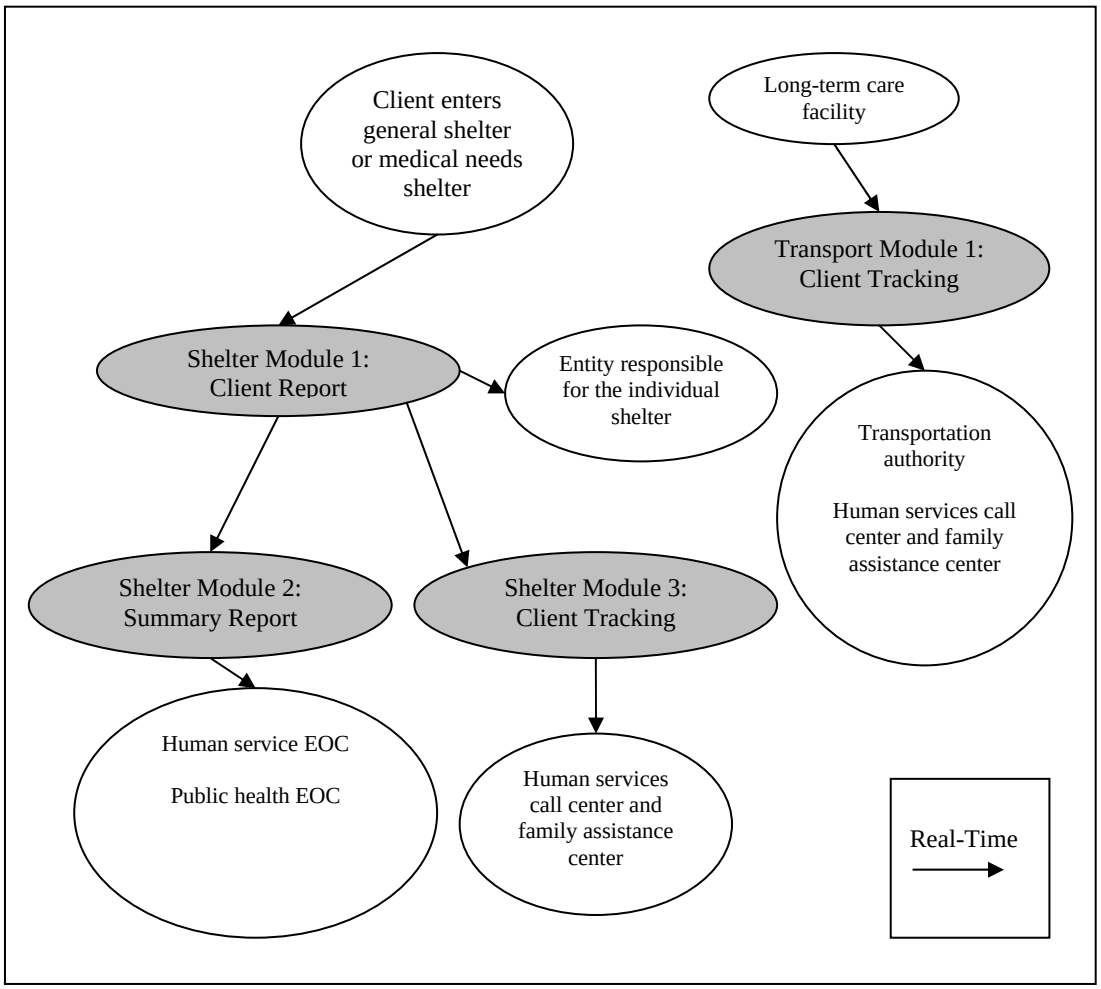

Figure 14. Human Services' Flow of Client Information—Ideal Process

E. ESF-5: EMERGENCY MANAGEMENT

1. Definition of ESF-5

> ESF #5 serves as the coordination ESF for all [state] departments and agencies across the spectrum of domestic incident management from hazard mitigation and preparedness to response and recovery. ESF #5 will identify resources for alert, activation, and subsequent deployment for quick and effective response. (Department of Homeland Security: *Emergency Support Function #5*, 2008)

2. Emergency Management

Emergency managers are mainly concerned with the functionality of the overall patient tracking system and want to ensure that each entity responsible can provide situational awareness when the emergency operation center is activated. There are two types of EOCs. The first type is the EOC, which is responsible for situational awareness and requesting resources from the state EOC. The second is the state EOC, which is also responsible for situational awareness and locating and assigning resources.

a. Emergency Management's Flow of Information—Current Process

From an emergency management perspective, people are tracked in silos, and each silo is purchasing its own tracking systems to serve its needs. In the field, victims are tracked through EMS triage tags on the scene and the tags are then collected so the services know where each person goes. Once the person arrives at a hospital, he or she can be tracked through admissions records. If a person dies as the result of a disaster, medical examiner offices have records used to identify the individual's remains. Lastly, police departments collect missing person's reports by phone, which are then assigned to detectives responsible for finding those persons. Depending on where the person enters the system, a variety of information is collected, including but not limited to, name, demographics, social security number, medical history, and dental records. A record is rarely shared with other partners and when it is shared it can be out of date. For a figure of this process flow, see Figure 15.

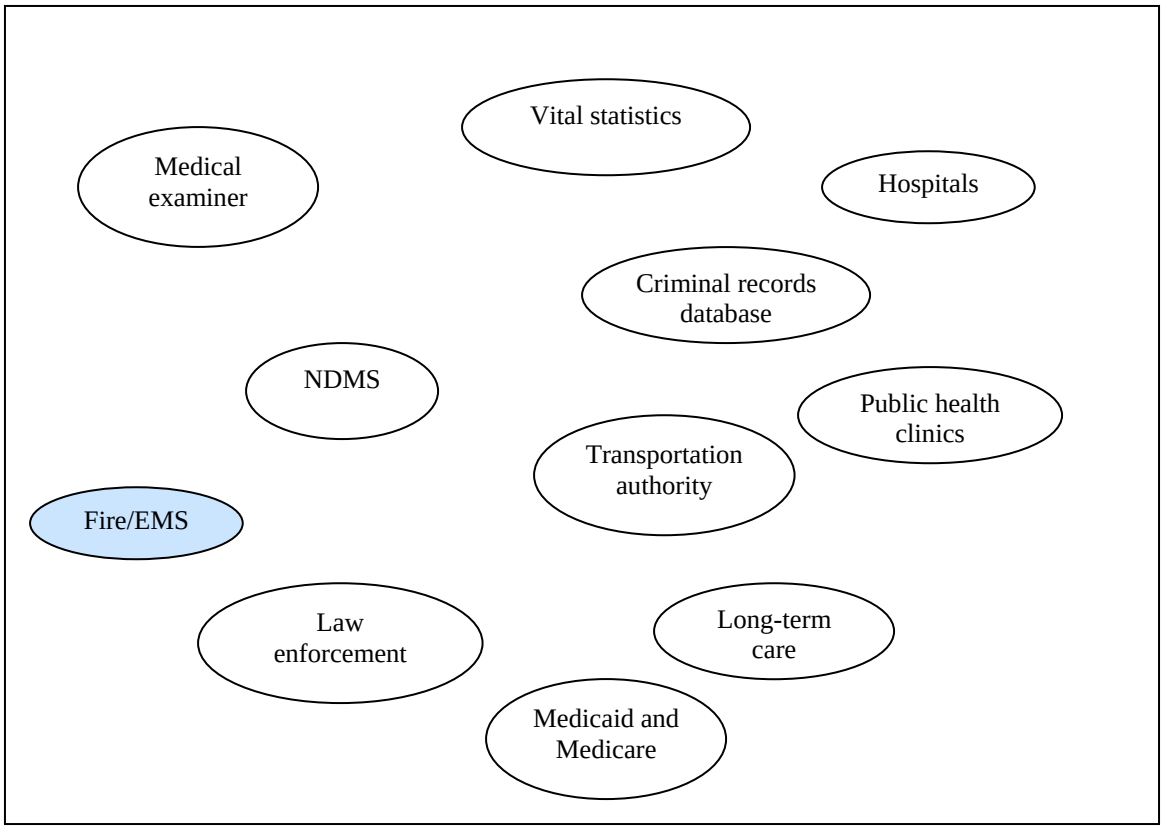

Figure 15. Emergency Management's Flow of Information—Current Process

b. Emergency Management's Flow of Information—Ideal Process

Ideally, emergency management would like to see a host of information shared between entities. Since a number of entities are involved in disasters, they all play a role in tracking the people they touch during the disaster. Emergency management wants to know if that information is being shared in ways that it can be used by other entities and by emergency management itself. For emergency managers, the focus is on situational awareness and the assurance that local operational processes are solving the problem, not creating more problems.

In an EOC, all this information should be provided in summary reports for planning purposes. For example, knowing how many people are in shelter is helpful because then the EOC would be able to monitor capacity and make more informed decision about whether to open additional shelters and what to then tell the public during

an event. Or knowing bed availability in hospitals versus how many people need treatment out in the field, can help public health emergency managers determine if regional resources are needed. Emergency management has a great need to know the current state of the environment and its needs can span into any discipline depending on the event. This thesis does not cover every possible discipline that emergency management may need to extract information although some are shown in the process model below.

If EOCs have access to the various summary report modules outlined in this thesis, this would serve their situational awareness needs. This could mean direct access to the modules by downloading a software application. If the entity does not allow direct access due to internal policies, the EOC could develop its own module that is interoperable with the others and pulls information through a middleware. Either method would suffice although one may be technologically easier to implement over the other.

If the number of modules continues to grow, it may be impossible for emergency managers to manage the large quantity of information. Consideration will need to be made about organizing the information that allows emergency managers to process it quickly and accurately. For a figure of this process flow, see Figure 16.

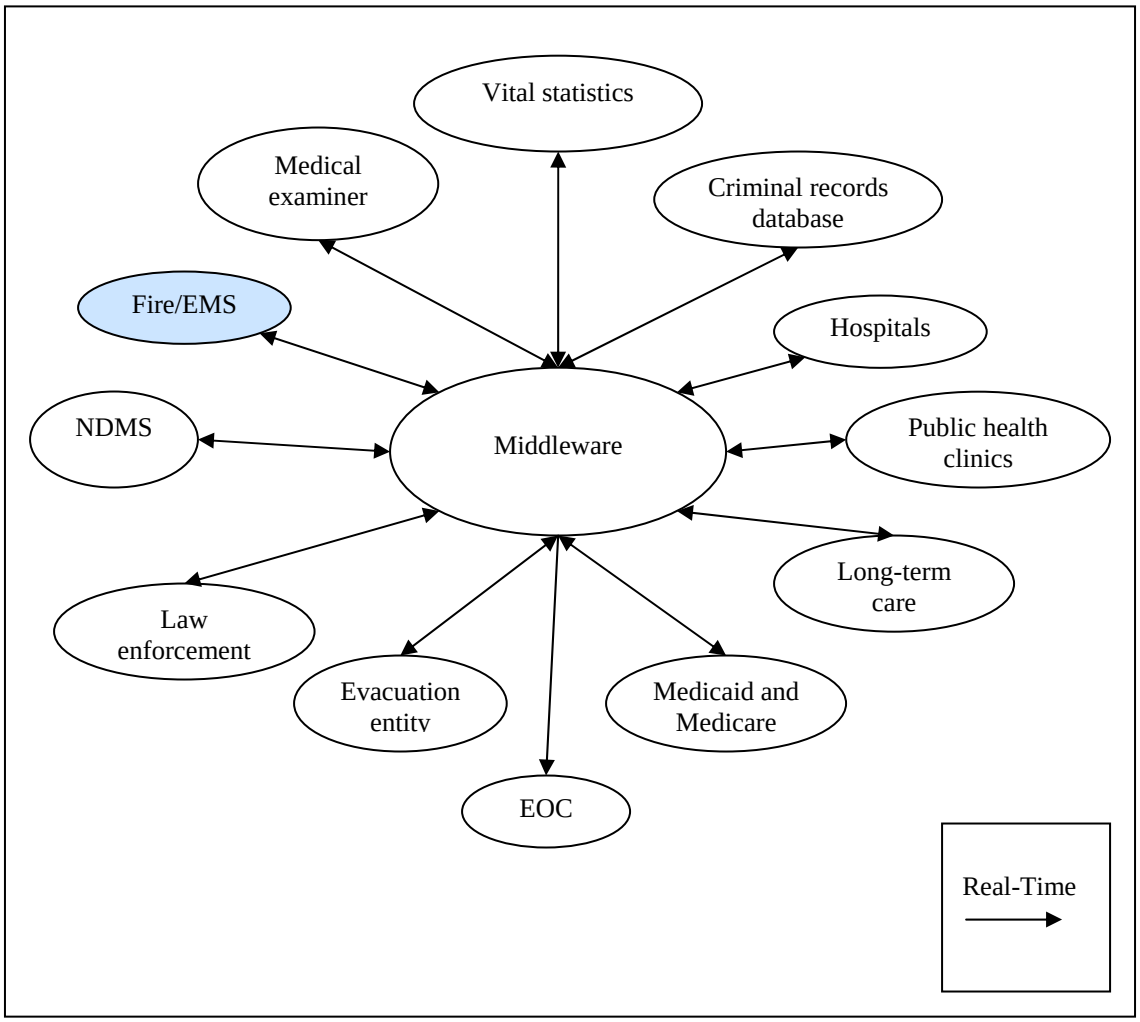

Figure 16. Emergency Management's Flow of Patient Information—Ideal Process

V. RECOMMENDATIONS

A. THE 17 MODULES THAT ACHIEVE PATIENT TRACKING

To achieve patient tracking, one must first analyze the system locally, by discipline, to ensure that processes are in place to achieve patient tracking. Once processes are in place and information is being captured electronically, it is important to then think about the information sharing process.

The achieve patient tracking locally, 17 modules (Appendix A) should be developed and employed. Of these 17 modules, there are three types of modules. The first type is the patient-specific module. This module is necessary for the remaining modules to be functional. It is in this module that all the data is collected out in the field. The second type is the summary reporting module. This module is used to get a snapshot of the situation, since patient tracking is also about situational awareness. The third type is the patient tracking module, which is dependent on the existence of the patient report modules. The patient-specific module is the primary method data is gathered and that information is transferred to the appropriate summary reporting modules as well as the patient tracking modules. Organizations may share their associated patient tracking modules with other appropriate organizations to achieve nationwide patient tracking.

These modules are constructed as detailed in Appendix A. The data fields shown are the minimum data fields required for the system to work and to comply with the requirements of local entities. Also listed is who should have access to the modules in order for the system to be successful. Patient tracking is about sharing information and without the exchange or access to data, it cannot be achieved. Modules can be shared by either providing software access to systems creating the modules, or they can be Web-based systems, which would be more user-friendly and easily accessible without complicated networks. Only an internet connection would be required.

Ownership of the individual modules is based on ownership of the process. For example, since EMS is responsible for patient care in the field, they should also be

responsible for the reporting process for EMS Module 1: Patient Report, EMS Module 2: Summary Report, and EMS Module 3: Patient Tracking. It is only EMS, not any other entity, which can collect this data. It is also important that the process owners own their associated modules because each can be tailored to meet the needs of the individual process owner. For example, a state may have a regulation to track specific demographic data. This can be incorporated into the module by adding additional data fields; however, data fields should not be deleted since other modules are reliant on certain pieces of information. Modules should be designed to be as useful as possible so that patient tracking can be achieved. The idea is not to change current processes; it is to enhance them to achieve patient tracking.

Now that the localized modules are in place, it is important to share that information to achieve nationwide patient tracking. Figure 17 shows the information sharing relationships between the individual modules. For example, in looking at public health data, Public Health Module 1: Patient Report shares information with both the Public Health Module 2: Summary Report and Public Health Module 3: Patient Tracking. Information gets summarized in both of these modules to help public health administrators perform their individual functions within a public health emergency. Public Health Module 3: Patient Tracking then shares information with the Missing Persons Module 2: Client Tracking to assist human services and law enforcement with locating missing persons. Tables 1 and 2 show the agencies and associated personnel who will need access to the various modules and whether the personnel provides information for the module or receives information from the module or both.

The data exchange can be completed by utilizing a data-sharing technology such as the one used to achieve the health information network. While there are a number of data-sharing technologies in place, an appropriate technology will need further research. The idea is to link the data in the various modules in a way that transfers the appropriate data to the other module. The system needs to be programmed in a way that only transfers data that is appropriate for the receiving module. This should help to alleviate some of the legal challenges when sharing information and will streamline the large

amounts of data available. This process is facilitated by the entity responsible for implemented the data-sharing technology to be employed; however, this does imply ownership of nationwide patient tracking.

Nationwide patient tracking is actually a decentralized organization. It is owned by all the entities involved and decision making occurs at all level. Since no one organization can really own the project, it is important that the project be lead collectively rather than hierarchically. The local emergency management agency can be the initiator of the project, but it must create an environment where all stakeholders can bring essential resources and knowledge to the table to create nationwide patient tracking system. The group must be fluid and be accepting of change in membership. It must also establish a core hub so that the original vision is not lost and progress can continue. By employing this method, a successful patient tracking system can be created that is useful for not only the individual organizations, but useful for the entire mega-community.

B. LIMITATIONS TO THIS STUDY AND RECOMMENDATIONS FOR FUTURE RESEARCH AND PRACTITIONER APPLICATION

This thesis attempted to present an ideal model of a national patient tracking system. While it did accomplish this task, it also has limitations. Although this thesis did cover a number of disciplines, a study should be conducted to determine if other stakeholders need to be added to the patient tracking process. If other stakeholders are identified, it will be easy to plug them into this model by analyzing their current processes and their future needs. This thesis provides a great framework in which to gather future data from additional stakeholders.

A technological and legal feasibility study should also be conducted. It is unclear if current technology is equipped to handle some of the ideas presented in this thesis (i.e., reading hospital wristbands). In addition, if this model is adopted, data-sharing standards will also need to be agreed upon and a legal analysis will assist with restraints associated with the Health Insurance Portability and Accountability Act. While these topic areas were not the main focus of this thesis, further study will help to tailor the ideal model

presented here into a model that can feasibly be implemented. The ideal model presented here is the necessary first step in the implementation process.

In January 2009, during this study, the Agency for Healthcare Research and Quality (AHRQ) released a documented entitled, *Recommendations for a National Mass Patient and Evacuee Movement, Regulating, and Tracking System* (2009). The document addresses an ideal model for tracking and AHRQ is the lead in developing a nationwide patient tracking system. The model developed in this thesis should be compared to the model developed through the AHRQ project to determine if there are any other emerging ideas that need consideration. Through the leadership of AHRQ, homeland security practitioners should continue to provide their input into patient tracking models.

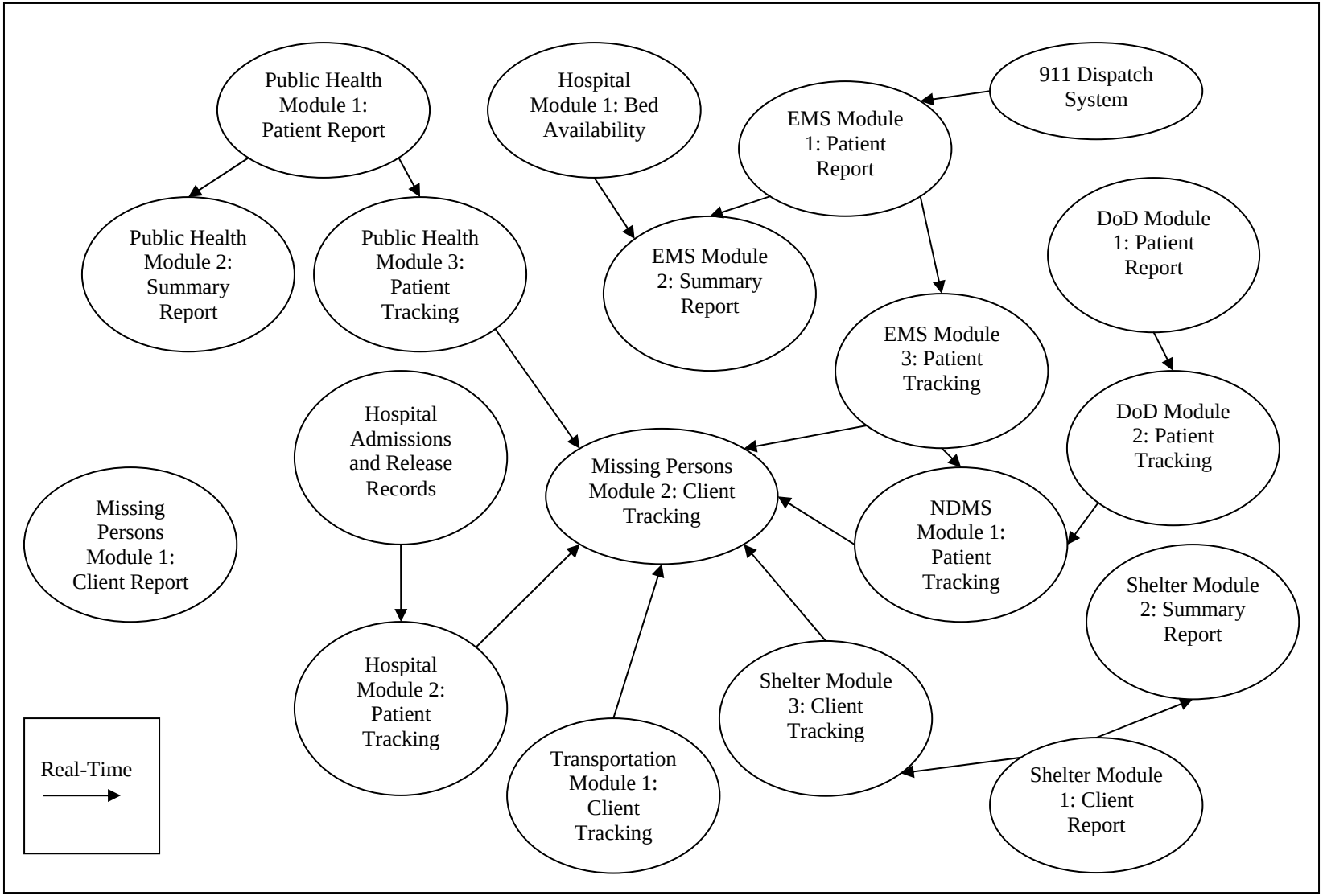

Figure 17. Interoperability between Modules and Other Systems

Table 1. Information Exchange per Actor for Modules in ESF 8

PI = Provides Information; RI = Receives Information; B = Both

	PH 1 Patient Tracking	PH 2 Summary Report	PH 3 Patient Tracking	Hosp 1 Bed Tracking	Hosp 2 Patient Tracking	EMS 1 Patient Report	EMS 2 Summary Report	EMS 3 Patient Tracking
PH Clinic Registration Staff	PI							
PH Treatment Staff	B							
PH Immunization	RI							
PH Triage Nurse						PI		
PH Call Center			RI		RI			
PH EOC		RI		RI			RI	
CDC	RI							
Fusion Center		RI					RI	
Hospital Operations/ Admissions				PI	PI			
Hospital EOC				RI			RI	
Hospital Triage Nurse							RI	
Hospital Physician						B		
On-Scene Commander				RI			RI	
911 Dispatch						PI		

	PH 1 Patient Tracking	PH 2 Summary Report	PH 3 Patient Tracking	Hosp 1 Bed Tracking	Hosp 2 Patient Tracking	EMS 1 Patient Report	EMS 2 Summary Report	EMS 3 Patient Tracking
EMS Units						B		
EMS Authority						RI	RI	
DoD Medics								
NDMS								
Human Services Call Center			RI					
Human Services EOC								
Law Enforcement								
Shelter Staff								
Transportation Authority								

Table 2. Information Exchange per Actor for Modules in ESF 5, 6, and 13

PI = Provides Information; RI = Receives Information; B = Both

	DoD 1 Patient Report	DoD 2 Patient Tracking	NDMS 1 Patient Tracking	MP 1 Client Report	MP 2 Client Tracking	Shel 1 Client Report	Shel 2 Summary Report	Shel 3 Client Tracking	Tran 1 Client Tracking
PH Clinic Registration Staff									
PH Treatment Staff									
PH Immunization									
PH Triage Nurse									
PH Call Center			RI						
PH EOC							RI		
CDC									
Fusion Center									
Hospital Ops/ Admissions			RI						
Hospital EOC									
Hospital Triage Nurse									
Hospital Physician									
On-Scene Commander									
911 Dispatch									

	DoD 1 Patient Report	DoD 2 Patient Tracking	NDMS 1 Patient Tracking	MP 1 Client Report	MP 2 Client Tracking	Shel 1 Client Report	Shel 2 Summary Report	Shel 3 Client Tracking	Tran 1 Client Tracking
EMS Units									
EMS Authority									
DoD Medics	B								
NDMS		RI	RI						
Human Services Call Center			RI	PI	RI			RI	RI
Human Services EOC							RI	RI	
Law Enforcement				B	RI				
Shelter Staff						PI			
Transportation Authority									B

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APPENDIX A. PATIENT TRACKING MODULES

A. PUBLIC HEALTH CLINIC MODULE 1: PATIENT REPORT

The Public Health Clinic Module 1: Patient Report will consist of the following data fields:[2]

- Demographics
  - Name
  - Age
  - Sex
  - Address
  - Phone number
- Medical history
  - Allergies
- Care provided
  - Treatment/vaccine administered
  - Date of care
  - Name of nurse providing care
  - Location of care

This module will be available to the following, with the associated resources:[3]

- Public Health registration staff to collect demographics and medical history and issue a ticket
  - Standard computer with Web-access and a barcode printer
  - Tickets
- Public Health dispensing staff to document care provided
  - Handheld computer with Web-access and a barcode reader

[2] It should be noted that with all of the modules discussed in this section these are minimum data fields. More fields may be added to the module as the locality sees fit.

[3] Figure 17 and Tables 1and 2 graphically displays the relationship each of the actors has with each of the 17 modules.

- Public Health immunization section to document immunization provided
    - Standard computer with Web-access

This module should be used:

- During all public health clinical operations to include normal and mass clinics.

This module will interoperable with:[4]

- Public Health Clinic Module 2: Summary Report
- Public Health Clinic Module 3: Patient Tracking

B. PUBLIC HEALTH CLINIC MODULE 2: SUMMARY REPORT

The Public Health Clinic Module 2: Summary Report will display the following data fields:

- Total number of patients served
    - Sub-aggregated by clinic
- Total number of treatments/vaccines provided
    - Sub-aggregated by clinic

This module will be available to the following, with the associated resources:

- Public health EOC for situational awareness
    - Standard computer with Web-access
- Centers for Disease Control and Prevention (CDC) for situational awareness
    - Standard computer with Web-access
- Fusion Center for situational awareness
    - Standard computer with Web-access

This module should be used:

- During emergency events only.

This module will interoperable with:

- Public Health Clinic Module 1: Patient Report

[4] Figure 17 graphically displays interoperability for all 17 modules.

C. PUBLIC HEALTH MODULE 3: PATIENT TRACKING

The Public Health Module 3: Patient Tracking will consist of the following data fields:

- Demographics
    - Name
    - Age
    - Sex
    - Address
    - Phone number
- Location of care
- Date of care

This module will be available to the following, with the associated resources:

- Public Health call center in the event outbound calls need to be made to have patients return for care
    - Standard computer with Web-access

This module should be used:

- During emergency events only

This module will interoperable with:

- Public Health Clinic Module 1: Patient Report
- Missing Persons Module 2: Client Tracking

D. HOSPITAL MODULE 1: BED AVAILABILITY

The Hospital Module 1: Bed Availability will consist of the following data fields:

- Total number of beds available
    - Sub-aggregated by type of bed
    - Sub-aggregated by hospital

This module will be available to the following, with the associated resources:

- Hospital staff to input bed availability
    - Standard computer with Web-access

- Hospital EOC to monitor bed availability and determine resource needs
    - Standard computer with Web-access
- On-scene commander received bed availability to determine where patients can be taken
    - Standard computer with Web-access
- Public health EOC to monitor bed availability and determine resource needs
    - Standard computer with Web-access

This module should be used:

- During emergency events only

This module will interoperable with:

- Emergency Medical Services Module 2: Summary Report

E. HOSPITAL MODULE 2: PATIENT TRACKING

The Hospital Module 2: Patient Tracking will consist of the following data fields:

- Demographics
    - Name
    - Age
    - Sex
    - Address
    - Phone number
- Hospital

This module will be available to the following, with the associated resources:

- Public health call center
    - Standard computer with Web-access
- Human services call center
    - Standard computer with Web-access

This module should be used:

- During emergency events only

This module will interoperable with:

- Missing Persons Module 2: Client Tracking

F. EMERGENCY MEDICAL SERVICES MODULE 1: PATIENT REPORT

The Emergency Medical Services Module 1: Patient Report will consist of the following data fields:

- Demographics
  - Name
  - Age
  - Sex
  - Address
  - Phone number
- Medical history
- Initial complaint
- Signs and symptoms
- Treatment provided
- EMS unit number
- Patient identification number
- Point of origin
- Point of destination

This module will be available to the following, with the associated resources:

- EMS units to document patient contact and care
  - Handheld computer with Web-access and barcode creator and reader
- Hospital emergency room physician and nurses to assist with in route treatment orders
  - Standard computer with Web-access
- EMS authority to provide quality control
  - Standard computer with Web-access

- Public health nurses in a mass dispensing/vaccination clinic to document sick patients that need to be picked up to EMS and transferred to a hospital.
    - Standard computer with Web-access

This module should be used:

- During normal daily operations

This module will interoperable with:

- Emergency Medical Services Module 2: Summary Report
- Emergency Medical Services Module 3: Patient Tracking
- 911 dispatch system

G. EMERGENCY MEDICAL SERVICES MODULE 2: SUMMARY REPORT

The Emergency Medical Services Module 2: Summary Report will display the following data fields:

- Patient name and age
    - Sub-aggregated by priority
    - Sub-aggregated by destination point

This module will be available to the following, with the associated resources:

- EMS authority for situational awareness
    - Standard computer with Web-access
- On-scene commander to determine hospital destination
    - Standard computer with Web-access
- Hospital triage nurse to determine how many patients are arriving at the hospital for treatment
    - Handheld computer with Web-access
- Hospital EOC to determine how many patients are arriving at the hospital for treatment and resource needs
    - Standard computer with Web-access
- Public health EOC to determine receiving hospital resource needs
    - Standard computer with Web-access

- Fusion center for situational awareness
    - Standard computer with Web-access

This module should be used:

- During emergency events only

This module will interoperable with:

- Emergency Medical Services Module 1: Patient Report
- Hospital Module 1: Bed Availability

H. EMERGENCY MEDICAL SERVICES MODULE 3: PATIENT TRACKING

The Emergency Medical Services Module 3: Patient Tracking will display the following data fields:

- Demographics
    - Name
    - Age
    - Sex
    - Address
    - Phone number
- Sub-aggregated by point of origin
- Sub-aggregated by destination point

This module will be available to the following, with the associated resources:

- Hospitals to determine where their patients have been taken
    - Standard computer with Web-access
    - Human services call center and family assistance center for family reunification
    - Standard computer with Web-access
- Public health emergency call center for situational awareness to the families when human services is not activated
    - Standard computer with Web-access

This module should be used:

- During emergency events only

This module will interoperable with:

- Emergency Medical Services Module 1: Patient Report
- Missing Persons Module 2: Client Tracking

I. DEPARTMENT OF DEFENSE MODULE 1: PATIENT REPORT

The Department of Defense (DoD) Module 1: Patient Report will consist of the following data fields:

- Demographics
    - Name
    - Age
    - Sex
    - Address
    - Phone number
- Medical history
- Signs and symptoms
- Treatment provided
- Plane number
- Point of origin
- Point of destination

This module will be available to the following, with the associated resources:

- DoD medical staff
    - Handheld computers with Web-access and barcode creators and readers

This module should be used:

- During normal daily operations

This module will interoperable with:

- Department of Defense Module 2: Patient Tracking

J. DEPARTMENT OF DEFENSE MODULE 2: PATIENT TRACKING

The Department of Defense Module 2: Patient Tracking will consist of the following data fields:

- Demographics
    - Name
    - Age
    - Sex
    - Address
    - Phone number
- Sub-aggregated by point of origin
- Sub-aggregated by destination point
- Date of each point
- Plane number

This module will be available to the following, with the associated resources:

- DoD/National Guard serving under Title 32 to document patient contact
    - Handheld computers with Web-access and barcode creators and readers
    - Standard computer with Web-access

This module should be used:

- During emergency events only

This module will interoperable with:

- Department of Defense Module 1: Patient Report
- National Disaster Medical System Module 1: Patient Tracking

K. NATIONAL DISASTER MEDICAL SYSTEM MODULE 1: PATIENT TRACKING

The National Disaster Medical System (NDMS) Module 1: Patient Tracking will consist of the following data fields:

- Demographics
    - Name

    - Age
    - Sex
    - Address
    - Phone number
- Individual patient transfer
    - Name of entity transferring
    - Unit or plane number
    - Point of origin
    - Point of destination
- Date of each point

This module will be available to the following, with the associated resources:

- NDMS to provide information about patient points of origin and destination to stakeholders
    - Standard computer with Web-access
- Hospitals nationwide to determine where their patients have been taken
    - Standard computer with Web-access
- Local public health call centers nationwide to assist with family reunification when human services is not activated
    - Standard computer with Web-access
- Human services call center and family assistance centers to assist with family reunification and missing persons
    - Standard computer with Web-access

This module should be used:

- During emergency events only

This module will interoperable with:

- Missing Persons Module 2: Client Tracking

L. MISSING PERSONS MODULE 1: CLIENT REPORT

The Missing Persons Module 1: Client Report will consist of the following data fields:

- Name of caller
    - Address
    - Phone number
    - Concern
- Demographics of missing person
    - Name
    - Age
    - Sex
    - Address
    - Phone number
- Other identifying information
- Place last seen
- Priority of report
- Notes
- Location of person if found
- Category of report status
    - Open
    - Closed
    - In-person follow-up required

This module will be available to the following, with the associated resources:

- Human Services Call Center or Family Assistance Center to assist with family reunification and missing persons
    - Standard computer with Web-access
- Law enforcement to begin the investigation process if the case remains open with Web-access
    - Standard computer

This module should be used:

- During normal daily operation

This module will interoperable with:

- None

M. MISSING PERSONS MODULE 2: CLIENT TRACKING

The Missing Persons Module 2: Client Tracking will consist of the following data fields:

- Query capabilities
    - Demographics
        - Name
        - Age
        - Sex
        - Address
        - Phone number
- Results report
    - Individual locations that missing person presented and the date the person was there

This module will be available to the following, with the associated resources:

- Human services call center or family assistance center to assist with family reunification and missing persons
    - Standard computer with Web-access
- Law enforcement to begin the investigation process if the case remains open
    - Standard computer with Web-access

This module should be used:

- During emergency events only

This module is interoperable with:

- Public Health Module 3: Patient Tracking
- Emergency Medical Services Module 3: Patient Tracking
- Hospital Module 2: Patient Tracking
- National Disaster Medical System Module 3: Patient Tracking
- Shelter Module 3: Client Tracking
- Transportation Module 3: Client Tracking

N. SHELTER MODULE 1: CLIENT REPORT

The Shelter Module 1: Client Report will consist of the following data fields:

- Demographics
    - Name
    - Age
    - Sex
    - Address
    - Phone number
- Location of shelter
- Type of shelter (general or medical needs)
- Date of admission
- Date of check-out
- Patient diagnosis (for medical needs shelter clients)

This module will be available to the following, with the associated resources:

- Entity responsible for the shelter (i.e., American Red Cross)
    - Standard computer with Web-access and barcode creators and readers
        - Wristbands

This module should be used:

- During emergency events only

This module is interoperable with:

- Shelter Module 2: Summary Report
- Shelter Module 3: Client Tracking

O. SHELTER MODULE 2: SUMMARY REPORT

The Shelter Module 2: Summary Report will consist of the following data fields:

- Total number of occupied beds
    - Sub-aggregated by shelter location
    - Sub-aggregated by shelter type

    - Sub-aggregated by specific diagnoses
- Total number of remain beds
    - Sub-aggregated by shelter location
    - Sub-aggregated by shelter type
- Total number of clients with medical needs
    - Sub-aggregated by diagnoses

This module will be available to the following, with the associated resources:

- Human services EOC for situational awareness
    - Standard computer with Web-access
- Public health EOC for situational awareness
    - Standard computer with Web-access

This module should be used:

- During emergency events only

This module is interoperable with:

- Shelter Module 1: Client Report

P. SHELTER MODULE 3: CLIENT TRACKING

The Shelter Module 3: Client Tracking will consist of the following data fields:

- Demographics
    - Name
    - Age
    - Sex
    - Address
    - Phone number
- Sub-aggregated by point of origin
- Sub-aggregated by point of destination

This module will be available to the following, with the associated resources:

- Human services call center and family assistance center to assist with family reunification and missing persons
    - Standard computer with Web-access

This module should be used:

- During emergency events only

This module is interoperable with:

- Shelter Module 1: Client Report
- Missing Persons Module 2: Client Tracking

Q. TRANSPORTATION MODULE 1: CLIENT TRACKING

The Transportation Module 1: Client Tracking will consist of the following data fields:

- Demographics
  - Name
  - Age
  - Sex
  - Address
  - Phone number
- Sub-aggregated by point of origin
- Sub-aggregated by point of destination
- Transportation unit number

This module will be available to the following, with the associated resources:

- Transportation authority to document contact
  - Handheld computers with Web-access and barcode creators and readers
  - Wristbands
- Human services call center and family assistance center to assist with family reunification and missing persons
  - Standard computer with Web-access

This module should be used:

- During emergency events only

This module is interoperable with:

- Missing Persons Module 2: Client Tracking

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APPENDIX B. INTERVIEW NOTES

A. INTERVIEW 1: PUBLIC HEALTH ADMINISTRATOR

We mainly track patients in exercises. We did it specifically for large flu clinics and some mock situations where we did not have patients. The processes vary depending on the situation. The first time, we used a computerized system. We had laptops, the forms were on computers, and we directly entered the data, which included basic demographics. And we did a basic medical screening looking for symptoms and contraindications for medications. It was just a brief one page forms. The system had the capability for swiping information from driver's license. Actually, I don't think it had that capability at that time, but they talked about it. We could do pictures, and we did. There were a lot of issues with speed with the computer entry and the internal network had problems. The structure of the building was a problem and we ended up shutting it down and going to paper. The paper forms had the same information. We actually had people filling out paper at the door and handing over the information so that it could be input before the patient moved on. It was partially live input.

The next exercise was all paper and since then it has been paper. We never had a system where data was entered immediately, so we pretty much stuck with similar formats of demographics, the minimal amount of medical that you need (age, pregnancy, dose related to weight, allergies).

In a pandemic influenza scenario, we have to give the patient a copy of the care provided and information on returning for additional doses. Contact information was critical and giving them information about the need to return was critical. In a different scenario, it was just a one shot deal and the patient was out the door. We did not have to bring them back. We just focused on the number to get them through quickly. With a influenza vaccine, we have to give the vaccine provided to our immunization program. Once the data is collected, we have to put it into some kind of system like excel or the immunization database. They don't normally put influenza vaccine into the vaccine database, but we could to track them. This year we had to put the information into

Vaccine Doses Administer Database (DAX), the CDC system. That was cumbersome so we used the patient tracking system database that we have.

When patients need to return for follow-up and if they don't return, we don't go find them. We put the responsibility on the patient to come back because there are too many people to deal with to find them. If they made it the first time then they can come again, and we would just do a general broadcast. Now, with a closed point of dispensing (POD) that is different because you know who was exposed. There is more controlled and it is easier to deal with.

Tracking people by following them through a location or a building is one thing, but trying to find people and linking them up lost relatives, especially children, is important. In the realm of patient tracking, one thing that gets lost is capturing inform that is useful to people that need to provide care. It is not just about moving people, it is about knowing what a person needs so you can make a decision about a person in a quick and organized way. How information flows so that it is there in front of you is essential. If you have different kinds of medications that you are dispensing, different contraindications, the information has to be organized so that there is little on the spot decision making as possible. This is better than having one piece of information on one sheet and another piece of information somewhere else. This makes it harder to quickly determine medications. In a disaster, it can be difficult to think quickly when you are trying to process that many people. If a decision needs to be made, the information needs to be organized appropriately to treat them quickly and adequately. That has come through loud and clear when we worked with the electronic patient tracking systems we have tried in the past. Even how you set up a hardcopy is just as important. I've seen some that are nice, that have an algorithm. The thinking is done for all the different scenarios. The algorithm tells the nurse what medication to give and the nurse would just confirm. It is smart technology that builds in the algorithms. They have systems like this for disease management that guide and point you in a direction. You would still apply professional discretion and nurse could override it. For speed, to get a lot of people served, that is the best way to do that.

In an ideal world, I would want that feature for certain known issues. Regarding the flow of medical information, it would be good to look at electronic medical records because those have patient information in a usable format for a medical professional. Medical professional are frequently forgotten even though they are the main user.

Having electronic medical records interoperable would be good for a disaster situation because you could pull down information into whatever you are using, like medical information from primary care providers or hospitals. I don't know how you would sort through it so it would still be quick. It would be helpful if the system sorted information by looking for certain things and not picking up the fact that you had knee surgery, but instead looking for allergies or heart conditions that would interfere with medications or if you were on medication already. Than you would enter your data in the system and it would be sent back to the system that collects the private health information. This is a health information network. You would want a private physician to know what service we provided.

One of the issues we ran into when sheltering is that we did not know what types of medications the person was on. During a large apartment building fire, there were many people with special needs. We needed to know what medications they were on because they had no idea, but they knew what sickness they had. We wanted to link up with the home healthcare agencies that serviced these people because they had the information and should continue to provide service to them while in the shelter but the agencies expected that the Red Cross or public health provide the service. They were just trying to connect the people back to the services they already had. By the fourth or fifth day, the connections were made and the home healthcare agencies began to visit people in the shelter rather than their homes. They are important because they have so much information about these patients. Emergency management would need demographics to deal with looking for people.

With the mass clinic, when you are sick, you go to red line and eventually go to a hospital. You give the patient a piece of paper that has the information on how the

patient was cared for but you don't know if the piece of paper made it with the patient. It is important that the hospital knows what was done at the mass clinic in terms of treatment and diagnoses.

You always have to know where people are and where they have gone next. This helps find missing people.

The ideal patient tracking model should be available in both a disaster and in normal operation. You can do this by making it modular if you have an electronic medical record that you can pull from different places. One module might be a registration module that could be attached to something else. You could have flexibility to use it easier. Patient tracking is hard to envision when thinking of this modular thing. Patient management can be thought of as patient tracking. If it is used during clinical operations, you could follow the person in their care, where they are, where they are going, their appointments, etc. That is one way to have it modular and things can be fed into it. They all talk to each other, pull pieces, and use bits and pieces. You can add new modules as well.

Barcodes can be used for patient tracking. Without it, you are relying on a piece of paper getting there with the person. You need some type of identifier on the person that links them back to their record. If a person cannot speak, a barcode is nice, or if you are tracking them through to the morgue. It is easy to use barcode scanners. Or there is the driver's license thing as an identification piece if they had a driver's license.

There are problems with people verbally saying who they are on a day to day basis. People use other people's social security numbers. Adults can use social security numbers of children who are deceased. We give our own picture identifications out. We don't care who they are in reality because they forget what identity they are using. It is unclear if it will work with the rest of the population because I am not sure if people have their social security numbers memorized; with identity theft, people don't want to reveal their social security numbers.

Linking to families would be needed and aliases. Different identifiers would be required to eliminate duplicate files, especially with ethnic names. A smart system that

compares files would be helpful. Linking to families is helpful even though you saw them separately. This is helpful especially when a family has to pick up bulk medications.

In a mass clinic, there are different stations, to include registration and dispensing. The information from registration needs to get to the nurses in dispensing. If there are computers and information is captured at registration and the patient is given a barcode then the nurse can just scan it. The nurse has to document what treatment she gave and she needs to confirm that the information given at registration was correct. There has to be something that is a quick reference. The system also cannot get in the way of the process. Speed of barcode is great, but you have to remember that if you are using technology it may not always work. You have to mind the logistics because you don't want to have to set up too much computers. The more computers, the more you have to set up and the more expensive it gets.

B. INTERVIEW 2: HOSPITAL ADMINISTRATOR

When a hospital is receiving patients from the field, EMS gets on their radio and tells you that a 28-year old male is going to one hospital and another patient is going to another hospital and another, but we've never practiced it. it is on paper. One of the reasons why we have never moved from the scene to the hospital is because they say they do it all the time, but we have never done it in large numbers or in multiple places. We may know the patient is coming or some particulars but that's all.

Our emergency department (ED) gets a radio call that there is a large scale incident. EMS sends people to the scene. They may be told there are a certain number of patients, and then they have to triage. When they start to transport, they call us. Hospitals will determine what numbers they can take, and hospitals get back to them to tell them how many. The same thing happens in counties close to us, and we are on their radio system because their hospital doesn't have the capability to treat them. In a large scale disaster, it is a problem. Another problem is that, for the ED to be tracking the patients, you've got the 800 Mhz radio in one place; and it cannot be moved in the ED and the doctor or nurse is getting that information. But, the information actually needs to

go down to the triage nurse who is developing a list of what ambulance is bring which people and as the patients arrive she can check them off. You could have a walkie-talkie where the nurse gets the radio call and walkie-talkies the information to the triage nurse in another area, but information errors could happen if you did that. The incident dictates where the triage is. If the incident requires decon, or if there are a large number of patients, the triage moves outside. The triage has to be mobile so a walkie-talkie would be good. She also needs to know room availability so she needs to be in contract with that information. Communication is the big link, and maybe it should be that paramedics number the patients rather than saying it is a 27-year old female. You have to follow the information trail. We've never had an incident so large that it has overwhelmed us. If there were 30 patients we might lose track of them.

If the family members show up looking for significant others, we would call the other hospitals that we knew received patients as a part of the process. We wouldn't make the phone calls while they were coming in because it is not our highest priority. Parents show up even before the children do if it is a bus crash. But, it is not us that has the information, it is the scene that does. Hospitals just don't have time to find out where the people are at that time. The highest priority is to save the lives of the people that they have. Is there a coordinating center that can help?

Tracking boils down to communication. You can track patients. If the victims are coming in a random way, they can be absorbed, but in the rare cases that you get 100 people in two minutes; that is the problem. Hospitals can also do triage of people who are walk-ins.

Triage tags and the EMS patient care reporting system could be used to track, but in an incident will they actually use them? If helicopter transport becomes involved, red tag patients go to hospitals outside of the area so that the yellow tags don't become red tags. You don't want all the red tags sucking up your resources. By taking critical patients to other areas, the hospitals can deal with it. The volunteer fire companies know that if they contact us we will send a shuttle bus to the scene to transport patients because it takes so long to get a Department of Transportation bus.

The ideal patient tracking system for evacuating the facility is a reverse process. There are checks and balances in the plan. The bed board would be the control center. Harry Jones is in a specific room. We would need to communicate what ambulance he is going into. The concern is that the ambulance drivers might not take the patient where they say they were. So if the hospital's records say they are going one place, but then the ambulance never takes them there, when the family member goes up to the hospital they thought they were in, it would be dealt with it then. We would probably get back on the line to tell the scene that a patient was actually brought to our hospital even though the patient was not suppose to be brought to that hospital.

Hospitals should not have to do the phone calls to find people. But, if you send the family to the scene, who do you tell them to go see? One of the challenges for the hospital is how to interface with the local authorities. I just developed a policy for dealing with a John Doe, and we didn't have one for so long because we never had a John Doe. The state police always figure out who these people are. It might take them an hour, but they can identify the people. We rely upon the information given to us by the authorities.

A coordinating center would help. The coordinating center would have to be able to be set up within minutes. When something happens, you have to do something now. The logistics take time, unless it is just sitting there. Maybe it is in the county building with an information center. The center has to be linked in with the scene and with the hospitals. On the scene, the patient is just a description. When you get to the hospital, you get a name after critical care is provided. The guys in the field don't have time to check identity. It is the police who are concerned about the identifications.

The coordinating center should fall under emergency management. On a normal day, we work with EMS and police. Sometimes bodies are brought to the hospital because the scene needs to get cleared due to scene safety when it is really a coroner issue. If the patient is hospitalized and dies within 24 hours after an accident then they are not a medical examiner's case. But, if the guy gets shot, then that is different. It is situational. Hospital has to give the medical examiner any information they have on the patient.

C. INTERVIEW 3: EMERGENCY MANAGEMENT ADMINISTRATOR

There have been no events in our area that required an advanced level of patient tracking during my time here. There have been mass casualty incidents in the past that have required patient tracking from the scene to a hospital. Tracking would entail what patients were treated on scene and what hospital they went to and then they would follow up with the hospitals to get patient information for their own records. Patient information is a name, demographics, social security number, and medical history. Whatever information is available is what you want to keep. The patient may not be able to give you that information. As an emergency manager, I have more interested in the overall system rather than the clinical information.

There are other types of emergencies that require tracking people. I track patients as well as those that are evacuated from a city or a scene. I also want to track people that are deceased because families will call. It is important to manage the missing person's aspect of it. There is not a lot of infrastructure in place for tracking victims. We want a comprehensive system that can track all of the issues, such as fatality, patients, missing persons. A victim is someone that may not need healthcare.

Currently, there is not a central system for tracking people. In an event, people would be tracked by showing up at hospitals through admissions records; through EMS' SMART system where the patient has triage tag and the tag identifies where the person goes, and they collect a portion of the tag so they know where the person goes: the medical examiner's office records and the police department where there are missing persons reports by phone and detectives are assigned. New York is looking at developing a more comprehensive and advanced system for tracking victims.

It is better to use the term victim because it identifies everyone. It is not about tracking one type of person, it is about tracking everyone because there are consequences no matter what.

The missing persons part will be the most difficult to manage. In the Hudson plane crash there was a manifest so it makes it easier. Generally, you receive a hundred

or more calls about missing persons for every one person. You can get tens of thousands of calls. You need to plug missing person's reports with reports on the diseased, patients, and evacuated people.

Emergency management is not interested in tracking all the individuals. They are interested in a higher level view of the whole process. We are still researching tracking people and have not developed a technological solution yet.

The goal is to put together a missing person's report of an actual victim. You may want to unify the person with their family or identify the person in hospital bed or deceased. It is not important for emergency management to collect that information, it is more important for that information to be collected by the medical examiner, hospitals, and missing person's reports.

To report a missing person, the call is routed to police department, which creates a missing persons report and it is assigned to a detective. In a mass casualty incident, there can be thousands of casualties and many more missing people's reports because people are just calling in case because they are worried. All the reports need to be evaluated, and it could take years. It is currently done like this, but it is not the best way to do it.

We just looked at medical examiner's office in New York, which has the Unified Victim Identification System (UVIS). It has an interface for customer service operators to create a missing persons report. People would call 311, a government helpline, to report the missing person rather than the police. The benefits of using 311 are that there is a synergy with service, and you can track requests that come in, and you can request progress reports. That would be the primary point of contact; operators would fill out a form to begin the missing person's process. Police would reach out to the person that placed the report for additional information whether it is dental records or other personal information. The medical examiner's office would also be involved because that is where human remains are identified. Their system is geared toward fatalities.

In an ideal world, our system would be like the fatality management system, but it would address other victims as well. The interface to input missing person's reports is simply a series of questions that lead the report to be categorized to different levels of

priority. So in a case like 911, if you thought that your uncle was in New York today but you were not sure, the system would prioritize that less because you were not sure. If someone called and misspelled the name, it can combine reports by finding other common identifiers. It can also prioritize what needs to be followed up on immediately. An investigation still is required. You can import other data like hospital and EMS. You want to centralize missing person's reports so that you can control where information is coming from. You can also add a website application where people can enter missing person's reports online, but someone still needs to look at them to make sure they are accurate and consolidation still needs to happen.

Missing persons is just one part of the system. There is also the victims themselves. In New York, they have handheld devices with barcode scanners, screens, keyboard, and cameras mounted on them. They are wireless. They are used for scanning a patient triage tag at a hospital and match it with a person triaged on scene by EMS. The medical examiner would use it to take pictures of human remains on scene. They could also tag and scanning a barcode to create a record there. You have EMS scanning a triage tag before they get loaded on a truck to the hospital, but at the hospital they would scan the tag there to get the information about that person that was input on the scene. If you were setting up a reception center for people that evacuated or who are in a shelter, you would have Red Cross giving people a wristband with a barcode to create a record of that victim. You have to capture information about all kinds of victims and all of the information is in one database. This technology does exist. Salmander System is a victim tracking technology that has a patient application, but it doesn't track everything we need for the deceased where we need a dental image of their teeth to identify them.

At this point there are different databases that track different things about victims, and if you have the money, you can customize them so they can all work together. That is what New York is doing. What concerns me is you have the federal government is interested in patient tracking, and states and locals are interested in patient tracking too. Everyone is buying their own solutions and you have to wonder how they are going to work together. The states are not buying systems that the locals will want with federal grant money. It is the locals that need to make those connections.

Ideal system is that it should be centralized. Information is collected in various ways in various places, and then all that information needs to go to one central place and the missing persons reports need to be capture in one central place so you match up with other info.

Regarding access to data, because of Health Insurance Portability and Accountability Act (HIPAA) information cannot be shared openly with the public. You should have the capability to have a government agency taking responsibilities for following up with public regarding individual missing persons. The individual specializing agencies would keep the information. Hospitals would consider sharing their information as a HIPAA violation. If you have a well organized system that allows everyone to manage all the data, then you make them responsible for it.

New York would like to have the tracking system every day, but the problem is, in the event of an emergency that everyone calls to place missing person's reports. If you accept reports immediately then the system gets flooded. People will not take the time to use their own means to find out where their loved ones are. If you don't accept them immediately, you will get less in the end.

It is just like electronic medical records. It is the same thing. All these people are buying patient tracking products, but we need to develop standards as to what patient tracking systems looks like. The federal government needs to say that the solution needs to look a certain way and private companies will step up and create solutions; and it needs to be holistic. We all have different missions, but they need to come together.

You should talk to police and talk to people regionally to get different perspectives on how it should be done. Medical examiners will be hardest because sometimes just body parts.

D. INTERVIEW 4: LABORATORY ADMINISTRATOR

You should add an epidemiologist to your list of interviews. The hospitals have access to our laboratory management system. We put in the demographics. There are certain required fields, name, and date of birth. Hospitals and other places are putting it

in. This is Laboratory Information Management System (LIMS), the laboratory information system. The main problem with demographics is we often get paper forms from doctor's offices but if it does not have all the information so we have to call them to get it. If incorrect information is put in, like a spelling error, than there is problems.

The patient goes to the hospital for care and needs lab work and if the lab work is done at public health lab they add the request electronically into LIMS and the specimen comes down to the lab with a barcode, and we read the barcode and get all the information in LIMS. We pull up the information, run tests, and enter the results, than the doctors can go back into the system to find the results. Epidemiology can go in to find out how many positive flu tests, how many influenza A and Bs, etc. I don't think they enter any LIMS information. Then the information does into the disease reporting system. Right now LIMS and disease reporting system don't talk, but that is the plan because at some point you want the system to dump into other systems so you don't have to enter everything.

In an ideal world, the LIMS reports can be put into any system that way you have one set of information being shared. We have other partners too like office drinking water and the environmental control agency. Quest has the same kind of system as LIMS, and the docs would get the reports.

The system can be improved by allowing the system to communicate a back and forth exchange of data with other systems like epidemiology, drinking water, and food programs. It would be nice if some hospitals had a LIMS system so that if a patient had a test done with public health lab and with Quest, the two reports would get merged so they just have to look at one report. Same with the CDC. We report certain things to them and it would be nice if we could report to them with a push of a button and with other state labs in the nation.

In an emergency situation, if MD was having problems and needed our help with capacity it would be nice if their information dumped into ours so that we knew what we

had to do when the samples got here, and then our information would dump right back into theirs with the results rather than having to enter it all over again. You have to put patient information in to put results in.

If doctors are doing rapid flu tests on their site, it would be nice to get that information through LIMS by LIMS talking to their system. Even though the samples come here for confirmation, it would be nice to get the results of the rapid flu. There are more examples, like rabies. We have to put it in our system then put it again into CDC. The CDC system does not talk to LIMS, and we have to put it into the CDC system to report. PulseNet for food testing is a nationwide system from CDC, and we have to put those tests in there as well as LIMS. It would be nice to just type in a name into a system to get all the results rather than going to 15 different systems. There are private labs, public health labs, hospital labs, and doctors that do their own testing.

E. INTERVIEW 5: HUMAN SERVICES ADMINISTRATOR

Our organization does have tracking procedures depending on the circumstance. It is not called patient tracking because we are social services. In a disaster context, it is a integrated service center. The Red Cross and other entities, like Salvation Army and emergency management, have co-located their public operations where it is a one stop shop. There is a logical progression. You start with one agency and more to another and another. There is no wandering like a job fair. The best case is when the client can tell their story once and not have to tell the trauma a dozen times. It is not to their benefit regarding mental health. Some may become annoyed and see it as a waste of time. But the ideal is when information can be take from an existing case record and transported so the client does not have to repeat themselves. You have to retrain your teams to not start from the beginning, and this requires integration between entities.

They are setting up a system nationally called the Coordinated Assistance Network (CAN). It came out of one hurricane season. There is a national level effort with pilots where the Red Cross and other national service delivery entities work off a common platform. The client starts at one place and does not have to start from scratch when they go on. They have to sign something so that they can release information to

other places. When the disaster victim goes from response to recovery, one of the front end agencies that they meet gets the clients signature that they are allowed to provide clients information to others on a list to help them in the recovery mode. The Red Cross can provide a list to organizations that can help and those agencies can reach out to the client. This has been done on the spot for the Voluntary Organization Active in Disaster (VOAD) members. Legal compliance is part of the challenge with tracking or sharing information.

Case loads are not for years, but only a few weeks. We have initial contact with the client and in some cases secondary contact if they need additional assistance or if they need to provide additional documentation. Assistance is tracked in a national database when populations are displaced in the United States. We would only keep them for a week or two and we would attempt to transition to other social service agencies, like state social services, VOAD, or the Salvation Army.

We get demographic information and family composition because we want to open cases at the family level so you are not tracking at the individual level. It is a time saver, and you don't want to give a child certain resources like an assistance card. But it is challenging because in some cases you have to prove relationships.

There is a shelter process and there is a registration desk so when the clients come in, they register. There is a check-in and check-out process. You need security to make sure the rules are adhered to.

There is a disaster health services function in the shelters. There is a nurse available when possible. There is a disaster health services filing structure and the information is filed with the social work paperwork. I am not sure if it is electronic but I will ask.

The Coordinator Assistance Network is the way to go. The more integration the better off we are. We need more efficiency and effectiveness. The CAN should be available all the time and not in just big emergencies or at least the network should understand that this is where we need to go but there are control issues.

F. INTERVIEW 6: EMERGENCY MANAGEMENT ADMINISTRATOR

We have tracked patients indirectly and directly. The EMS portion of the incident command system usually does the patient tracking at the scene and relays that to the hospital. Normal and rudimentary information is obtained, like what is your name, your age, and your problem. This helps to determine triage priority. It is usually written on paper or dry erase board at the scene. On the scene, when there are a lot of people, you put whatever identifying information on a board so that you can prioritize them. You might not have their name, but just age and main problem. Then you tell the hospital that there are three priority one patients being transferred, and one of those patients is a 24-year old female and is a trauma motor vehicle crash. It is all transferred verbally through the radio.

Once the patient is triaged, we have the triage tags, and information is written on the tag, and the tag has a barcode on it so essentially we have the beginnings of a patient tracking system. When you break them off into their triage groups you have some level of tracking (i.e., 10 priority ones; 2 priority twos). You can start distributing them to the hospitals. Once you transport that patient in the ambulance, the person then gets an identity with whoever is providing the direct care. Now they have the tracking responsibility of collecting all the data on that person. That emergency medical technician (EMT) is responsible for filling out a patient condition report, which gets loaded into the EMS patient care reporting system. It starts with the barcode, it moves to the patient care report, and then it moves to the hospital and the hospital creates their own chart. Then the EMS patient care reporting system has all this information in it.

The EMS patient care reporting system is the complete patient assessment report from EMT. It has all the information about the patient. On the scene, you are not really collecting that much information. You may jot it down, but then how much actually gets transferred over. On the scene, you have EMT, Advanced Life Support, and Basic Life Support. You have the command portion of the incident and you have the hospital portion of the incident. You also have the legislative agency, which provides oversight to the process and they look at things like what happened to the patient from start to finish,

was the 911 call properly assessed, was the patient presenting the information properly. When the person calls 911, they present their problem. 911 uses dispatch protocols that go through a set of questions like are you breathing and it determines the level of the call. If it is a bus crash with specific casualties, then we use the mass casualty plan to determine the level. If it is a Level 1, then we send a certain number of units. Here you have the EMD and the computer aided design (CAD) collecting information at dispatch. This is relayed to them by radio and by the CAD. EMS collects information on the scene from the patient by asking questions to for the patient care report, which gets disseminated. The patient care report was supposed to be accessed by the hospital. The patient care report is not completed real-time when the patient is brought in and sometimes it is done hours later. Generally, you are getting a verbal real-time (from EMS to hospital). From command, you are getting a verbal to the hospital of number of patients and priority. At the apartment building fire, we were able to get a tenant list, and we just checked people off but at an accident you don't have that. In an accident, if they are affected, some may say they had Joe Smith with me but they never did. Victims have an altered mental state, and sometimes they are just out of it. At the hospital, they have their charts, which is separate from the trauma system. The legislative agency has the patient care reporting system, but it is after the fact collection and reporting. There are the triage tags too, which is the physical attachment that you can put on the person. There is a barcode but nothing to read the barcode with.

Salamander technology has a system that gives you the components. If you are a patient, I slap an ID card on you and enter the information. I attach the tag to you. A reader can read the barcode. The reader sends the signal back to the host that loads the information into another system. That system can be accessed by the hospital and command on scene. The only thing missing is the accountability process of knowing how many patients I have.

The other piece of this is: if this person calls 911 and gives there information to 911, that information gets linked back to this system that feeds back to the reader. So when I show up, I can look at my reader and see there is a 60-year old woman named Jane Smith. So I just ask are you Jane Smith? Yes. Okay.

In a catastrophic emergency, the media is not going to be calling command, but will be calling emergency management, and we need to give the public information as to what is going on. All I have to do is look at a system to give clear information. I can explain that there were 20 people affected with non-life threatening issues, real-time, without giving specifics about patients.

You could have three modules, the detailed look, the overview look and the tracking portion, which is tracking patient name, age, and priority condition. Then you can have an overview look that just tracks number and priority conditions. And that can be set up by who is viewing and who has access to the system.

The public starts to call saying I think my aunt was on that bus, and where is she going. They don't know she is going to hospital. Then she shows up at hospital, and they have handled it. But the patient might not be there.

The ideal system is where the hospital has a view, command and emergency management have a view, and the legislative agency too. One person's concept was that that EMS would collect the information and fill in the patient report while in back of ambulance in route to the hospital so the hospital can view it, but they have to do patient care and can't do that stuff too. What becomes easier is a menu driven handheld device that you can drop down menu and type in key information like age, vitals, problems, allergies, condition, and status. Then you can fix the tag to person and the tag stays with that person in the hospital. Hospitals do this and it needs to be carried out into the field. The question becomes what does the tag look like? It is a bracelet; what color is it?

PeopleSoft is an amazing tracking database, but people just don't know how to use it. In a regional emergency, the state system does not work. We should use driver's licenses with barcodes as patient tags and standardize the fields so we all can work together. I need to know who you are and what your medical history is because it lets me treat you better. Then you just issue the scanner. The driver's license and the barcode can be the state and the regional solution rather than the tag.

If you want a multi-discipline, multi-jurisdiction tracking system, you are not going to have any one person owning it because you aren't going to have one person

updating the information. There is identity theft too. Motor Vehicle could own. You could use voice recognition for EMS to get the information into the system or telemetry to speed up the process.

The solution ideally would be the following system (Figure 18).

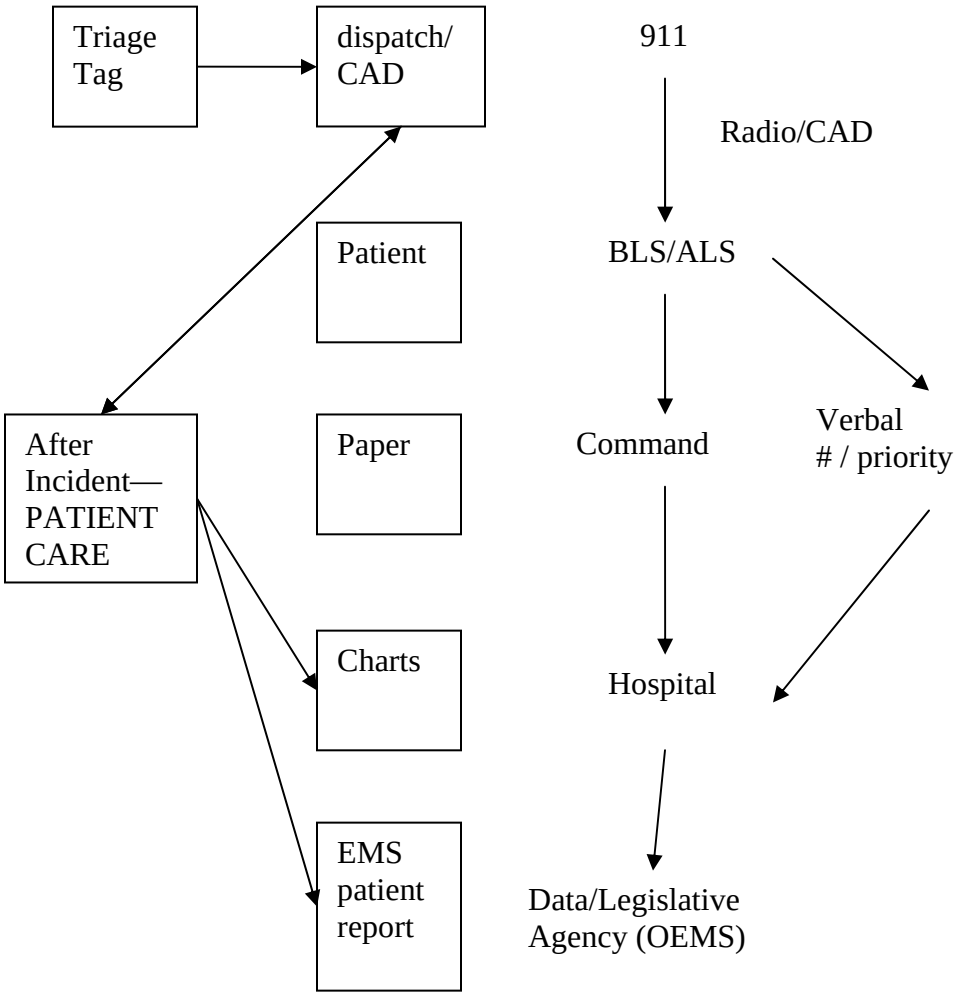

Figure 18. Ideal System for EMS

G. INTERVIEW 7: TECHNOLOGY ADMINISTRATOR

The Health Information Network (HIN) is an ideal model. The focus of HIN is more on the side of information exchange but isn't the objective to get the information needed to care for patients in the hands of those that need it? Having medical records is a

natural extension. When people start thinking about their requirements, this comes up as a need. It is important to think in the big picture first than find a technology solution and not think that a technology is going to solve problems.

H. INTERVIEW 8: PUBLIC HEALTH ADMINISTRATOR

Ideally, I think that a patient tracking system should be used every day and in an emergency. It would be encompassing with lots of fields, but the fields would be dependent on who needed them because there would be multiple people using the system.

For example, thinking about EMS, they use their patient tracking report now, and they would use a patient tracking system that had normally lots of fields because normally when they go to someone's house they do a whole survey and that information would be transferred real-time to whoever needed to see it. In this case, it would be the hospital emergency department. In a mass casualty, they wouldn't really care about that whole extensive medical history, so they could turn off fields (more so than turn on) because that would not be important during the triaging process. They would still put the information in, but just not extensive information because they would not be collecting that detailed information. The system could not be so rigid that if you do not enter the information in, you can't move on. The system would have to be scalable. It becomes a part of a medical record and when the person got to the hospital, the information would need to be entered. You can track them from their house, and then they end up going to a hospital to a morgue, to an acute care center, or to a mass clinic

All of the various nodes of care should share information with each other. And the more information shared the better. So you don't want to restrict information from people. For example, during the apartment fire, we did not know what medications people were on so it would have been really nice to see their medical records and their medication records, but to pre-think all of those scenarios it would be difficult, so the more information the better.

Patient tracking partners include EMS, hospitals, Red Cross, HIN, NDMS, public health facilities (clinics, long term care), and all long-term care facilities. The disability community is where it gets difficult, and the other clients that are in the community

because they have medical needs that would be of concern to us. The transportation department would push sanitized information like the person, where they are, and what equipment they would need for transportation. Same for the emergency management agencies (EMA). I'm not sure what kind of information they would need. Fire and police need to access it. I'm not sure about 911 centers but they probably do.

I don't think we can establish one system that everyone will convert to. We need a middleware like HIN and it just pulls information. The technology department would own it or the HIN would own it. We have disease reporting system that does this already and that is happening already with HIN. HIN is the major architecture. The disease reporting system gets all the details. That is the biggest challenge. We need to find out what fields everyone needs. And we also need the death certificates. It needs to go all the way to that. It is just people and whatever information is associated with that whether it is their medical condition or where they are within the system.

When people pull information, the application is not tailored. Once you determine the common fields, that is, what you translate. You don't translate obscure information, like pets are allowed at a particular nursing home. You don't need to see that. Whatever is common among all partners, that is what it needs to be. We don't care about x-rays. The purpose is to know where they are and what's happening to them so you don't mistreat them. For us, we need to know where people go regionally so we can work on how to get them back. It can't be so complex that it is hard to sort through.

The patient can identify themselves through a social security number if that would be permitted or through some type of identifier. But that could get confusing because all the different systems may use different identifiers, so that could get hard. It would have to be particular to that person and not by the event because then you could never track the information back to the person. It is the person we care about. We can do reports in all different ways. We don't care about fraud initially, but eventually it does come up but it is really about caring about the medical history of that person. If it is available all the time you don't have training or maintenance issues.

In an EOC, all this information should be able to roll up for planning. For example, if we knew there were people out in the field that needed medical needs shelters than we would know that we need to open two and they need to be opened in a particular place. So we can use it for planning. It would be good to know who is in the shelter because it is really hard to know in an emergency how many you have where, and you don't know whether the shelter is opened or closed. Knowing whether someone is Medicaid or Medicare is important because their provisions can get waived in a disaster, so it is important to know who has that so you can let them know what is available to them.

Unattended minors are important. We call it patient tracking, but not everyone is a patient. So it is important to define what a patient is. Do they become a patient because you gave them medication or because they are disabled and you need to move them? So the term patient is probably problematic.

The transportation department can use the filtered piece for evacuation, not the medical records. They just need to know who they are. They are just transport, and they are not deciding where they should go. If buses are used to transport people that need a medical attendant while in transport, these medical attendants should have access. But patient records are usually transported with the patients, and the ideal is to have it electronic, just like the UPS system, where you hit the barcode and it pops up. Paper records might still be used for redundancy. There needs to be a chain of custody with the people. I would want to know that they are here, they are here, and they are here. So at different facilities are different data points that are captured.

It is important to know someone's criminal background, so you would want to link up to the state justice information system. The system can also be used if people are not moving, if they are quarantined or if they are sheltering in place. It is about being able to get a picture. Quantum Lead was developing an intelligent board that decision makers could use. You can touch the board and all the information is displayed intelligently and almost in pictures so you can process the information very easily so you know what is going on all over the state. If you want to dive deeper you can touch it. No one can analyze all this information at the time of an emergency.

I. INTERVIEW 9: PUBLIC HEALTH ADMINISTRATOR

Patient movement is a huge issue and patient tracking is even bigger. NDMS has only been in existence for two years and every time we do something patient tracking always comes up.

From Gustav, we found that, for a long time, we have always relied on NDMS for patient movement. Katrina was different because there was no one around and DoD had to come, and they moved almost 4000 patients in 2 days. What has happened since then is that states have gotten used to that ability, so they are trying to build it into the regular planning. If you look at the patient movement system, you are actually using a DoD system, which is very much meant to do mass casualty lift, and the only tracking I have is that I have 60 people on the plane and I might not even have their last names because I am lifting them because a bomb went off—this is wartime.

During peacetime, I have a hospital, a nursing home, a facility, and some kind of provider that is going to connect to the system and call an accepting facility, and I've got a point-to-point movement of the patient, which in theory is very easy to handle. But if I have a big hurricane coming, I know I have to evacuate relatively early because planes don't fly in a hurricane. You have a very short window of time to push out patients. DoD has been the only gig in town. What we are doing is backing away from NDMS and working with the states, the regions, and federal entities to walk through what is patient movement and what are our mission sets and what are all the tasks associated with it. We can look at moving home healthcare, special medical needs, which is ambiguous because we all define it differently. You have all these different groups that we have to move. We have a process of what it looks like when you first pick up a patient to getting them to a receiving facility. Many different entities can move patients. We are trying to put all the different nodes on paper. In regards to NDMS, we have only looked at it from airhead to airhead, which is a relatively simple piece but we still haven't even gotten that right. It is really the front end. So my mom, she is in assisted living, she is on oxygen, you have to move her. So how does the happen? Is it EMS that picks her up, is it EMT or a FEMA ambulance that picks her up? How do you track that, and where do they go?

Now we move her on DoD from airhead to airhead and they go to multiple states and they don't always go to receiving states and they go wherever they can go. Some of them get in a car with their families, some of them go by DoD, and some of them go by National Guard. And now have where did they all go, and how do we get them home? The document that we are trying to create describes the system, and where all the nodes are that they can go, and we are breaking that down into 10 different phases, and these are the 10 different nodes, and we need to have to have the ability to do it at all of them. It is a very complicated system to try to get all the different states into, then break that down to all the different modalities of how a patient can move, and who is responsible for tracking, and when and how does it fit into one system. FEMA has overall responsibility so how does patient tracking and evacuation fit in with the larger picture of people movement?

What we are trying to do that this year, and next year we want to break down the roles and responsibilities of what pieces really fit. The problem is that as we continue to find our gaps through gap analyses with high risk hospitals, when you find a gap, you get a smart idea like the FEMA ambulance contract. So FEMA gives that to the states so is it the state's responsibility to track them because it is a federal asset. Typically, what we've said is until it comes to the airhead where patient lift occurs it is not a federal responsibility. When a person is taken out of a hospital that they have been evacuated to because they no longer need care, it is really a FEMA responsibility to return them. But, my leadership has said we need to track them through the system from entry to final disposition as an ending point. That makes it very difficult. It is easy to track them from airhead to airhead but getting the states to do that is harder. You don't have to have NDMS activated. If the home state wants to use DoD for patient movement, you can just request that, but it doesn't come with the support of the federal coordinating centers that comes with NDMS.

The easiest answer would be to use some type of system that pulls the data that is on the hospital bands. Nursing homes and assisting living don't typically have bands. That is what DoD wants to do to for the patients that they move. What Texas and Louisiana have done is they have a form so when DoD moves their patients; they have a

manifest so they have a list of who came out of the hospital. The form has all of the DoD categories already on it so the form is a part of the process from hospital to air head. Texas and Louisiana are two most of the advanced states.

Ever since we have started moving patients, we have done it backwards. When the patients go to the coordinating centers, we have people there trying to calculate the data of who was on the plane. The DoD system is meant to regulate the patients not track them. The DoD system just matches the resources needed for the injury on the plane. They do track them, but they don't give that data to anyone until they turn the patient over to the Veteran's Administration (VA) or DoD at the other end. There is no viable system that is ready to do that. We are using DoD's patient tracking system that they created because of the war in Iraq and Afghanistan, and they have offered that for commercial use, and we will be exercising that system over the summer. It is a Web based system with generic information like where they are coming from, where they are going to, what plane they are on so we can look at the records. The information is not feeding into anything else. We are letting the National Guard use it. The first goal was to use it to track patients as far as NDMS. The second goal was to add the National Guard when they get pulled into Title 10. We also wanted to eventually offer it to the states to use so we could all use the same system. In Texas and Louisiana, they have good systems when tracking patients on DoD, but that is about it. NDMS in Gustov and Ike sent out re-entry teams to work with them to find out where patients were sent. They went from hospital to hospital to figure it out so, we can try to get them back. It is a manual process.

In the ideal system, the data elements in the document I mentioned are useful. It took eight years for DoD to come out with a system they wanted. They tried to come up with the ideal first. At the end of the day, what I want to know is a last name and where that person is and I don't really need to know the rest of it. I just want to know where he is, and their original system got too complicated. So I agree with a lot of the data elements in the report, but I think it should be done simply first.

You would think tracking patients is not that hard, but if you add medical records to it and want to regulate them to the appropriate facility, and then it gets more

complicated. Then you have to have a system that does that. During Katrina we had a contract service that reproduced what DoD did. If seven patients ended up at a particular hospital, their names got fed into this system and were basically regulated in terms of where they needed to go, this is who needs to pick them up, this is the type of care they need, etc. And this contractor did all of that for us.

J. INTERVIEW 10: MILITARY ADMINISTRATOR

With military tracking, you want the receiving site to see who is coming to them; then the patient is transported through the echelons of care. It used to be done by paper, now it is electronic. There is a system to see where they are in the transport pipeline when military people are transported from another country to the U.S.

DoD integrates into current medical system to assist with surge. In the inauguration, we provided care to civilians, DC fire and EMS, public health, and the national park services. We had aid station down at the mall. Because we were dealing with civilians, they are not put into the DoD patient tracking system, so DC came up with a ad hoc system to enter patients that is Web-enabled and allowed authorized users to see who was seen where, complaints, diagnosis, what happened to them, and transport records. You can tell who was doing what. It was effective but an ad hoc that could be improved upon. You just need a laptop with an aircard and authorization. They are taking it out to vendors for help.

Florida has a system with a subscription fee. If you are a doctor who volunteers to go down to a hurricane to treat people, those people don't know what kind of medications they are on. But if they have a subscription service, all they need is a social security number and name to get the information. Hospitals joined the service and they upload their medical records, diagnostic imaging, everything. Field providers can pull all that up and find out their medical history. The outcomes would be so much better. In Florida, they are trying to expand it to the entire state. DC wants to test the system to import it to the National Capital Region. It is a fascinating system but it is based on people having to join it. As long as they are conscious the system works. It is unclear if you can build on the existing record.

When DoD supports civilian authorities, once they turn them over to civilian transport, they are gone so how does the information get to the receiving facility. Right now we use paper, EMS tags, and a record of care paper copy kept with the patient. The EMS crew hands that off at the door of the hospital. In a perfect world, it is all electronic, but how do you do that? A plug and play system where you can just plug into the ambulance to send/receive the information would be great. So whatever is done along the way, you would be able to find that out in the next receiving facility. For DoD to develop a system for civilians, it could only use that when they are authorized to work under the Stafford Act and under NDMS. Everyone would use the same system. You would think that it would be easy for federal government to provide a system to everyone, but if that is done everyone would need to use it on regular intervals to train on it. When DoD knows of an event, they pre-coordinate the event with partners and agree to what they will provide. If DoD treats civilians, it is really serious and hand them over to EMS who has control. DoD carries radios on the frequency of EMS. If EMS cannot take over, DoD ambulance will transport but EMS will direct to what hospital.

K. INTERVIEW 11: HEALTH INFORMATION SYSTEM ADMINISTRATOR

HIN is not a patient tracking device. HIN is an electronic post office. It receives information from data senders (i.e., hospitals, labs) and pushes it to physician's offices. Without HIN, a practice would have 3–5 ways of getting that information. It could be faxed, or obtained through individual portals, courier, a special printer (like a lab corps printer set up in a physician's office). What HIN does is it provides a single interface so all that information is presented to the physician in a single format. The doctor only has to go to their computer in their office, and they go to a secure electronic inbox in an email account or it gets automatically printed or it goes directly into their electronic medical record, so instead of getting that from 3–5 different sources it comes from one place in the same format. So lab corps results look the same as Quests and the hospitals. There is a standard format for the information to get presented. If I am the user, I know where to find specific information. HIN has presented standard formats for a variety of information and pulled that information from a variety of sources to present it in one way.

The one thing I can think of regarding tracking, but it is not really tracking it is more a way to access information on patients if you are processing them through an event, and you want to know who has been seen and where they have been seen and what information is there about them. I mean following patients through a system. What we have, and we are working on this now so it doesn't exist now, is we want to enroll all the emergency department physicians so that if patients show up in the emergency department they would be able to access any information the person has on them within HIN. The doctor's offices are able to have the same level of query, so basically if a patient shows up at a doctor's office or ED, the doctor would be able to query to find out what I have had done.

HIN information is real-time so if a patient just had a lab test done and the doctor gets that result it would be nice if they could have access to the most recent result, but we are not there yet. There are lots of issues that need to be resolved. Ultimately, HIN will be this network to get information and send information to where it needs to be.

HIN is not an electronic medical record and is not a source of information of anyone that resides or has had medical care within the state. The information is not in one big bucket. If you were at a hospital, your information would still be in the hospital system. What HIN does is that it pushed the information to whomever it is that ordered the test or your primary care provider, so it is moving and finding information where it exists. It is not storing all of it.

So health information exchange is what we are. We will probably be the connector for information in the system, but we did not create the information and we do not store the information. For HIN to work, people have to have a computer with high speed internet, license software, they have to enroll with us, and then we do a mapping process so that when results come through the system they know where to send the results. We will very shortly be able to do the queries so that if you cannot find the results, you can query HIN to find the results.

Say for example there is a public health emergency, and emergency managers don't need to know the details of who is affect, so is the system capable of doing a roll-up

report or summarizing the data in any way? We are already interfaced with public health for disease reporting information, and we have demonstrated this at the national level. We could demonstrate that if there were cases coming into a hospital emergency department, several coming into other hospitals as well that the time that that information is sent to public health. HIN reports it real-time and public health batches it, but if the event happened on Friday by Sunday, they would have enough information by Monday that they would be able to do something with it. In a paper world, it would take maybe till Wednesday to have that same level of information without HIN. We are not fully live with that yet, but close. The system will be looking at the symptoms, so the bio-surveillance stuff. They will be looking at what set of symptoms make up the condition that we should be suspicious of then they are looking at laboratory results or codes that are reportable like salmonella. Through HIN, it would process them and get them together quicker than in a paper or manual world.

Emergencies are not just local and we have to think about regional national scale so that, and the goal of HIN, is that if I ended up in California, the doctor would be able to query to find out things about me and not repeat test. We are a long way away from that, but that is the goal, to think about the interoperability of systems so that our information follows us and is not just stuck in our little doctor's office. There is money in the stimulus package to move forward with this effort. We are not actually tracking people but HIN has useful information.

L. INTERVIEW 12: MILITARY ADMINISTRATOR

During the inauguration, there was a patient tracking system that was ad hoc developed by Walter Reed Army Medical Center that was on a secured record that required id number, name, disposition, and where they were located. There were several aid stations at the inauguration. The primary purpose of that system was to have an overall idea of how many patients there were there and be able to transition to an emergency management type system if there was a disaster. It was a baby step. In addition, once a patient would have gotten to an individual hospital, they would have been tracked individually by the hospitals and our folks would have gotten the overall

reports of numbers, disposition, aero-evacuation needs. If they went through aero-medical evacuation, they would have been tracked through TRACES.

The most important data from our perspective would be whether a specific aid station or hospital or other organization is becoming overwhelmed. That starts to go away from patient tracking and comes more to situational awareness. It would be a roll up from how many beds do you have, but if there are any specific CBRNE events that we need to made aware of. It is a utilization type of concern and also from a DoD perspective once someone got to the aero-medical evacuation system, you cannot have someone on a plane unless you know who it is. That would be very important for the evacuation, but in emergency some of that goes to the wayside. We would not have visibility or would care about it unless there was a National Special Security Event (NSSE) or a Stafford Act Declaration, or if one of our facilities starts to become overwhelmed. On a day-to-day basis, we don't really need that information. We are at a different level. We are not at a tactical level but at an operational level providing support to tactical level.

The current system needs improvement. When I was looking at the system used for inauguration it was simple and okay, but concerning if we had to transfer people to another facility because the system might double count or lose track as the patients move through the system. The system is a help and better than having to call the individual aid stations to find out what happened but it is just not robust. The issue is that it is only turned on in an emergency situation, and I have not done the research to ensure that it is okay from a HIPAA perspective. We don't own it. It is a HHS system.

Our hospitals have systems that track patients, but it is more of a patient medical record. That would be the primary way to track, by looking through those medical records and the individual treatment facilities, which are silo system.

We have used tags that are pre-numbered that have the triaged categories on them. The tags would be run to our medical control center so they would know where people were at. If you have time it works well but not always. You just can't know where everyone is all the time. If you can give someone a bracelet that should work, but I

haven't seen any tests of those systems. Theoretically, it could work better than triage tags because it is more important to know if someone is alive rather than knowing where they are. An hour after the disaster, you get a better handle as to where everyone is.

It would take a lot of funding. Scan a patient in and issue a barcode. Same as what you would envision for FedEx, but still things get lost. A good system would predefine the datasets so you know what you wanted, name, disposition, location, intended destiny, and a system that scans in an ID like a bracelet that would be sealed onto the person. Medical history would be helpful, provided that there was appropriate legislative procedures in place that allowed HIPAA to be waived. Allergies are important, and you don't want to make the person's outcome worse.

M. INTERVIEW 13: EMERGENCY ROOM PHYSICIAN

We track patients routinely in the hospital to find out where patients come from, EMS to the ED to whether they are being admitted or not so we know, or to the floor, then afterwards we track their stay and afterwards they get sent either home, or depending on their situation, they get sent to a long-term care facility and rehab facility and so forth. So we do track. And in an emergency department and I'm sure most departments are they are busy, so most patients don't usual stay in the same room so patients actually do have to get moved from one area to another depending on the situation, so we do tracking every day.

It's mostly within and once they leave the hospital to another facility, we stop tracking them and it is the other facilities responsibility from then. So yes, it is basically within the hospital.

We get information from EMS. We get bits and pieces depending on the situation. They usually give the location where they picked up the patient. Most of the time it is in their residence, but a lot of the times it might not be in their residence, so from there we need information on not only where the patient was picked up from, but where the patient lives, the demographics as well too so and then they get tracked from

there so sometimes we might have to go looking for family members, depending on the situation, so that's a little bit of information hunting so than afterwards the patients come to the emergency department, and we go from there.

Name, age, allergies is more medical information than demographics, race. The patient tracking is most important when you are worried about infectious disease. Like for instance, we had a patient coming in with suspected tuberculosis, and it is very important that we actually track that patient to find out what other contacts exposures and so forth. it is not our responsibility as a hospital to do that, but we do work with public health on that.

We provide information to public health in the case of reportable infectious diseases. The other important thing would be trauma. So if they get involved in a car accident in might not be within their jurisdiction of the residence, so then we have to deal with multiple entities based on where the location of the trauma. Infectious disease, where the patient was found, where the testing was done, what our suspicion is of exposure risk. Demographics would be included as well as exposure risks, um, um, yeah, that is pretty much the main things, and, of course, how the patient is doing condition wise, they also like to know that as well too. Is the patient stable, not stable, intubated, and not intubated? Once again, hospital infection control people keep in contact with public health to let them know what the results are, how the patient is doing and so forth.

The trauma is a little more complicated because someone in one county might end up in an accident in another county so you have to deal with both counties. And we work with police; they also need information on injuries to the patient and so forth. And if there are criminal charges, any charges, those are going to be placed on the patient or on the person causing the accident. They need to be involved in that as well.

Mostly other trauma centers and mostly with police and the police work with whoever they need to work with, and we really don't get involved. Now, if it is a major accident that is affecting a large area, then we have to work with the office of emergency management, public health possible, but that is very rare. But it sometimes happens.

They would get their medical records, so everything that has happened in the hospital. Possibly x-ray and lab results, depending on the situation. Demographics as well. The most important thing for them would be the physical therapy consultation to find out what their expectations are, especially going to rehab or care facility. Whether they have any goals and so forth and try to achieve those goals. But most often it is only the background of the patient and anything acute that went on that they have to look out for. The medication list that we put them on versus what they came in with. Make sure there is some level of continuity of care.

For police, we would not give them medical records. Just information with the incident and honestly there is always an issue with the HIPAA violation whether we can give them specifically what happened. So most of the time, we just tell them if the patient will be admitted or not. We keep it very broad as possible from our perspective unless there is actually a warrant or something where they need the information then they go through those channels. Just speaking about trauma, the other thing I forgot to mention if there is multiple people in one vehicle, unfortunately, at times there is a whole family that was involved in the accident, they may actually be taken to different hospitals, so we may actually work with different hospitals to track family members involved. And being a trauma center, we get the sickest ones; that is why it is not every one coming to the trauma center. So the less sick may actually go to the closest department whereas the sickest ones may actually come to the trauma center. From there we try to work with those facilities to try to keep families together.

If police, they come in person, and information is verbal. We can't do it over the phone because it could be a hoax. For long-term care, it is phone to phone report and the hospital calls them. There is more control in who is getting the information if they call them. They get a nurse to nurse report and possibly a doctor to doctor report. Afterwards they send the medical records with the patient when the patient goes by medical transport.

EMS usually comes in, and they have to give a verbal and a written report to the ER. If they need more information, they can contact the supervisor on duty and ask additional questions.

When a primary care physician is sending someone in they give us a heads up. It is a verbal through the phone and may fax medical records from recent doctor's visits. It is a primitive process of information sharing.

There has to be a way to track. The way we do it know in our primitive way is easy when you are dealing only with one patient, but when you are dealing with multiple patients, it becomes more difficult. Tracking needs to start with first initial contact with a healthcare provider, mostly EMS and from there they need to be tracked until the patient gets home or long-term care. The more technology gets involved, the messier it gets. Radio frequency infrared, it tracks if in range but if not, it doesn't. Medical information, history, medications must be available too because there are patients that are not aware of that information because of dementia. Patient tracking + information tracking. Information gets messed up because when you are calling to get information on a patient; you might talk to a number of different people. You are not always taking to the same person.

Real-time information is ideal where we get where the patient is. We get a call from EMS that says we are this far away and there are a bunch of people waiting in the ER from the patient, but they never come. It would be more efficient use of resources and it is better for the emotional aspect of families if they know where the patient is. EMS might not know where the patient might actually be going. They tell the families they are going to the closest hospital but the hospital might be on divert so then they are rerouted to another hospital, and there is no way for EMS to contact families. Family comes to hospital and no patient and the person becomes "missing."

You have to be careful about who gets patient information. Identities must be kept secret. Not everyone should see everything. Redundancy is important so you still need paper trails. Electronic form is easier to share. The problem with emergency medicine is you only see them once and ER doctors are not specialists in chronic care but acute care. They might be able to stabilize blood pressure but it is harder to keep the blood pressure stable. The persons primary care physician may have them on a specific drug to do that and may have tried other drugs that don't work, so it is helpful if ER

doctors have that medical history, they want to know where they have been and what are the details. If it is off hours, you can't get the information. And if they got tests from another facility you have to call them.

Patient tracking is most important in a disaster because mass casualties in multiple locations. It is unclear if you can use one patient tracking system for all situations.

N. INTERVIEW 14: EMS ADMINISTRATOR

Currently, dispatch assigns a case number to each incident and they can vary between ALS and BLS and by county. If there are multiple people on scene, they get a suffix for each person. The case number stays with patient until they get to the hospital. The hospital gives them their own number. It makes it difficult to find patients with these numbers.

Ideally, it would be best to identify each individual at the scene and give them a number and be able to forward track and back track. It is important to have outcome data once the hospital discharges the patient to see if they made a difference. This is quality assurance.

EMS shares info with hospitals, but in a major incident they need to share information with family members. EMS uses the triage tags to keep track of patients. If the ambulance is suppose to go to one hospital but can't, then all the hospitals are trying to link everything together in real-time. So they had large lists in each hospital and faxed them around, but doing it on a computer would be easier.

There are verbal reports from the scene or in route regarding patient needs, sex, complaint, findings, vital signs, treatment, results of treatment, looking for any orders. Physicians will give orders and EMS will acknowledge receiving orders and if they can or can't do something. Some of the sicker patients will be assigned a room so they can prepare for when patient arrives. On arrival, they give another verbal, and a formal computer report to be a part of their chart for provider to care for them later. For those patients that do not need medical care immediately and who will sit in the hall waiting for treatment, the typed report is really important. It is hard to contact the crews for details

once they have left, and it is lost information. Patient care report system is computerized, but they don't always fill it out immediately. Some do it a few hours later and some a few days, and it is worthless by the time they do it. The patient care reporting system, once the information is entered communicates the information real-time to the EMS office or anyone that has clearance. You can watch information as it is entered. Currently, they have to print it and fax it to the hospital. The goal of the patient care reporting system is to provide a legible report of what happened, a medical document that can be referenced both on the short- and long-term, and used for data collection and quality purposes. It is hooked up to disease reporting system, and the fusion center can track some stuff. There are different levels of authorization. It does a roll up report and can be queried. If the incident happened between the county borders and they use their own incident numbers it is hard to track.

During a large incident, hospitals share where the patient went with family members but not other information. During normal operations they do not use triage tags, and it is more difficult to figure out who is who and where they went. Some sort of identification is required to track. Bar codes with patient records are used. Being able to just identify the patient and keep all the records with the patient and be able to transfer that information to another system would be helpful.

Triage tags are only broken out for major incidents so people are not use to using them. Something that they could use on a daily basis that was durable, easy, unique identifier for whole state, coordinate regionally along with state depending on incident location and level. Information would be shared differently depending on the incident.

Having access to some prior medical records would be helpful if it was electronically available, but the information would have to be prioritized so if the patient has a history of diabetes or seizures that would pop up earlier than some other medical stuff. Major diagnosis would be helpful all the way through the system. It would be nice if the patient's information was in one place and could be pulled up by anyone given appropriate rights.

They want to do lab work and critical care profiles pre-hospital, and if they could enter it into a device to be transmitted to the hospital, that would be good. EMS can expedite the patient flow through the healthcare system depending on what they find out in the field. So if they can find things out in the field, it only makes processing them more efficient when they get the hospital. You can interface other types of equipment, like Bluetooth and infrared. Now information is transferred verbally, but ideally the information should be easily transmitted to receiving facility.

Doctors have to give medication orders and EMS must document which doctor gave them the order because it is under their license. The size of the report is inversely related to the level of critical care. If the report is shorter, more critical care was needed; if longer, less critical care was needed. Monitors would be really helpful, so you don't have to hand transcribe and launch information to hospital and preparedness.

During the C5 plane crash incident, we had to deal with the governor, legislators, base doctors, Walter Reed, congressional contingencies. If information could be available electronically, it would save time. Information would also need to go to operations, scene people, hospital, supervisors, dispatchers, incident commanders so they know if they need to call additional personnel.

O. INTERVIEW 15: HUMAN SERVICES ADMINISTRATOR

We track patients on a large scale, not individually. When there was a flood, we had to move a nursing home across the street to the hospital, and we had to be aware of the numbers of ambulatory or stretcher bound so we could get transportation resources from Transportation agency. We did that because the nursing me administrator would talk to me and give me the counts by category. It worked fine. It could be improved. They should not have taken them to a hospital but another facility. This was poor planning. They should have gone to a separate facility. There medical records were not transferred with them, but they should have been. Most of the nursing homes now have plans that include records transport of the physical paper. An ideal way would be if the information were on computer and they could just take a disk with them, but we still run into the denial that it will not happen to them. In a large event, if they a number of

nursing home patients go to a number of different places, I don't see a way that they would be tracked unless they have in their plan where exactly they would go so then they would just call those facilities. The nursing homes think they know where they are going, but in a large scale they won't go to that spot.

The solution would be to have a plan that works and until they have a plan it is hard to deal with tracking. The long term care association is not affective because they cannot ask them to do anything else. In a catastrophic event, if they are missing, we would need the nursing homes to have a phone tree or resource line so that the family members could call in. Nursing homes should at least write on their body with a black magic marker because some cannot verbalize who they are and when they get to the receiving facility. The evacuating home should know where the patient is transferred, and they just need an individual identifier on them. Nursing homes are working off of paper.

The evacuating facility does not send information to any other partners. And she gets the rollup numbers as mass care ESF in emergency management agency to coordinate resources. This system would only be operational during emergencies.

When we did the apartment fire event; it was a nightmare because we did not know who was receiving services, from where, and what their needs were. If there had been information on them, it would have been better because we would have known what we were dealing with up front rather than waiting.

Dialysis patient's centers share info between themselves. Coordination happens verbally if another treatment facility needs to treat patient than normal. It is all just verbal orders. I don't know if it is adequate. Once we know they are being transported we assume they are getting care.

We are going to lose people. In nursing homes there is wander guard, but when you pull them out of the nursing home what are you going to do? They need an identifier; that is quick to do in a hurry.

The people in the community are a problem, and we don't know how to identify these people. You could put something on a doorknob saying you need help, but we just

don't have a handle on them. There are patients in the community served by home healthcare. Hospice could probably give us and idea but others numbers change daily. Is it there responsibility to know where their patients are and continue to treat them? They are contracted with the state that they still must provide service to patients at home, but how that plays out is a challenge. So they really need to know where these people are. We can't have a big database. Then there are patients in the community that are not being served by the state and we can't find them.

P. INTERVIEW 16: EMS ADMINISTRATOR

The patient tracking process is somewhat hit and miss. My view as an administrator might be different than the street-level person. There is variation by county. The person that needs to be tracked is one that is a higher level of care. In most cases, we are taking about a disaster where we use the triage tag. That is the process that gets them from scene to first level of care beyond EMS. What happens from there is up to the receiving facility. So you should have the on-scene triage, the tag, that is appropriately marked and identified by category then they go the appropriate place depending on the category. The ones that EMS decides can go home if they see them they examine them before they send them home. After triage, you want someone to look at the patient before sent home. A patient care report is developed when the person is interviewed more fully with their vitals and so on. The treat and release patients should definitely have a report. This is what should be happened but what does happen is situation dependant on the numbers. We have a great electronic reporting system. Any time we are taking the vitals or we are looking at a specific complaint. It may or may not be a secondary resource.

The people above that need a level of hospitalization or care beyond EMS. My concern is if there is a lot of patient going into the hospital and they give a verbal report and that's it, and they are off to get the next patient if we are talking about hundreds of people. But if it is just a van with 10 people rolled over on the highway, there should be a report even if they don't want to go to the hospital. Hospitals should get detailed reports through the patient care reporting system. The tags are used in high casualty

events and can be used in conjunction with patient care reporting system. The triage is separate from the report, it is before the report. There may be people who are triaged and don't get assessed if there are so many and they leave the scene. Tag might not match up with report. Or they might have a tag with no report. The tags are the primary way they are going to track when they have more than 20 casualties. The tag has a barcode on it, but it might not be used. In the field, you scan barcode and input information and when take them to hospital you update the information. Now there is no way to link the patient care report to the tag, but if you were to develop a better system you would be to go away from a paper tag and have an electronic tag that ties to the report where you can see where one person has been to all these different places. If you have 10 patients at an incident sometimes they will do tags, but they still need to do a report, especially when there is a lesser number of people. The tags are not scanned.

Primary users of patient care reporting system are hospitals and EMS office to look for trends and after action reviews and EMS agencies that generated. It could be made available to primary care physician. Now when report comes to hospital it should become part of patient care file in the hospital. So when patient is discharged if the primary care provider is part of the hospital network, they can see the patient care reporting system report. This is not consistent though.

The standard that is national is a continuum of care that starts with dispatch when a call comes into 911 and you want to have an electronic record of that person when they enter the system. So that is 911 or dispatch, then EMS, if there is any other interim pre-hospital care like a mass clinic than the hospital than rehabilitation. If you look at the rehab piece that has historically been the piece that is nonexistent, and there is no feedback loop. Data needs to be fed back to EMS for quality control to see what procedures have the best results. This does not include primary care, and there should be a way for them to look at all what happened so they know how to move forward too. We want a consistent tracking number. Dispatch doesn't feed into the loop because no care provided but they will generate the number. We probably want feedback from dispatch but not procedural information because that is pre-hospital treatment. At dispatch, say you have 200 people, dispatch gives an incident number. If lots of patient, the incident

number needs to get expanded to identify patient. The systems are not set up to accept that type of data input. A unique identifier must be issued for each patient so that might happen on the scene when they know who is there. The incident number needs to carry through. In the field, people take off then they go to the hospital or they come back to the scene so system needs to be able to add patient identifier if they skip EMS.

The ideal system is on all the time. But the challenge is to get the all the time system to tie into something that can be used in both disasters and during normal operations. EMS enters information into patient care reporting system at hospital and some have mobile data terminals but you are not seeing it entered while the patient is in ambulance because you can't enter data and treat patient at the same time. We are trying to get EMS to enter information in sooner. There is a dispatch time, EMS time when left station, got to patient, saw patient, left patient, got to hospital. We want time to be captured automatically at dispatch. EMS calls back to dispatch to get the times from dispatch and writing it on paper then put it onto computer which may be human error. And the same thing could be added to the hospital. And patient care reporting system would have to be interoperable with the hospitals but it is not now. Concept is to shorten the time. All the reports are getting to the hospital, but not all are timely but the hospital always gets the verbal. Standard is now four hours but not happening. If patient care reporting system is better, then that will reduce the time. When the report goes from patient care reporting system to hospital it is given to them in paper, and they are trying to make it electronic and the report can become resident of their system, and they can add an electronic report to their electronic file if the hospitals want it. Could be legal issues because the data is owned by EMS. When you say who gets a look at what, primary care only needs to see information for their patient, EMS only gets feedback on info they transported. EMS doesn't want hospital to see all their patients treated. This may enable attorneys at hospitals to go on fishing expeditions to the EMS data.

Once you get past the trauma surgeon, they may want addition information like the surgeon, but this might not be feasible for EMS because the goal of EMS is to transport and provide immediate care.

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